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What are Your Prospects?

WHAT a human question!—how wide in its appeal and how general in its interest! To young men in particular it gets right home, and when referred to in these pages it possesses a special attraction and significance for electrical and other engineering students and apprentices.

To those older men to whom the years have brought in these uncertain days surprising and seldom thought of disappointment, may be tendered an expression of sympathetic hope that their valuable experience will hasten their absorption in capacities as congenial as may be. Yet taking the long view, to these as well as to the beginner, the ultimate scope offered by the progress or otherwise of electrical engineering is a momentous matter. It is to the younger men, primarily, however, that these words are addressed.

Electrical and allied engineering surely has a need somewhere for men well versed in its practical and theoretical electro-technics and experienced in its industrial affairs, but a sudden awakening to a new situation must involve personal introspection and stock-taking of one's qualifications as well as an instant readiness to adapt oneself to the new situation which requires them in middle life to seek another job and to be prepared to take one of a very different kind.

There are young men in our colleges or undergoing works training who are to-day asking: Is there any future at all for me in electrical engineering, or have I entered upon a long and costly period of apprenticeship or other training—with little more than doubt and uncertainty at the end?

Time was when the pages of some of our engineering contemporaries in a period of slump told sorry tales—the only thing lacking was the black border!—concerning the overcrowded state of the engineering profession, but students continued, notwithstanding, to pour in and out of the colleges and institutions, and new industrial developments aided by the natural disappearance of men under the three score and ten years order of life, absorbed them if they were genuine engineers. If they were not, they found their way to something more to their liking.

But we had not then two million unemployed—that is the gloomy change which, of course, hangs over us

when we make some of to-day's calculations. And some branches of electrical work cannot make expected headway while other industries are depressed. We are without any indications of a sudden change which will absorb any considerable number of the workless—even a stationary or slightly decreasing number would be very welcome. Yet we want to say something to enhearten our younger men, to prevent the damping down of fires of hope in the breast of the student-engineer, and with that object in mind we counsel such to try to take a longer view, led by such interesting reflections as are advanced by MESSRS. ROSEN and DOWSON in the article on "The Future of Electrical Engineering," which appears in following pages of this issue of the ELECTRICAL REVIEW.

In a leading article on "Engineers and the Future" (ELEC. REV., February 8th, 1929) we quoted LORD LONDONDERRY'S statement made before a Tyneside engineering institution to the effect that we were only on the threshold of scientific development, and that older engineers ought to use every endeavour to attract young entrants and apprentices to the twin professions of engineering and shipbuilding. To-day Messrs. Rosen and Dowson, after devoting special study to the problem from a coign of engineering vantage on Tyneside, place plainly before our readers what they confidently believe to be the outlook considered from the standpoint of electrical and allied engineering. We commend their contribution to the attention of young engineers everywhere, as well as to the notice of professors, lecturers, instructors, works managers, and foremen, whose life is, or should be, largely one of responsibility toward them.

Young men who are on the threshold of their career are being urged to avail themselves of every offering opportunity that present-day dulness forces upon them to increase their fitness and add to their equipment and efficiency for the struggle. The world never will be able to do without engineers—particularly electrical engineers. Britain needs first-class engineer salesman capable of securing the rapid turnover of our products when the whole world shakes itself free of the trappings of its present economic nervousness and depression.

Where do Contractors go in the Winter Time?

THERE are so many meetings being held in the October-April months of the year that to dare to suggest an addition to their number may appear to be at least unreasonable. Yet is it not just possible that if the members of one of our associations, the E.C.A., met a little more frequently in the open they would know one another better, and the electrical industry would better understand their problems and the progress that is being made in dealing with them? We quite understand that the chief object of their existence as an organised body is to watch over their united and individual interests and take concerted action along with other associations existing for similar purposes. But the contractors seem to fall into a somewhat different category from the manufacturers, the cable-makers, the accumulator makers, and so forth. They are concerned in so many matters that interest almost everybody that one wonders whether it would not be for the general good if they held occasional winter meetings of their own to hear papers and discussions regarding their work. The annual dinners in London and in the provinces afford members useful opportunities for social reunion, and their five annual summer-time conventions have been so successful that one wonders whether they would not be benefited by taking another step forward. Apart from those read at the summer convention, how many papers on electrical contracting questions are read in the course of the year? It is impossible for the Institution of Electrical Engineers to give more than a small part of its time to any specialised department. Other associations, such as the Supervising Engineers, do their best, but the impression left upon our minds is that electrical contracting is one of the least discussed subjects, notwithstanding that it is the one which touches the electricity-using customers of the industry more closely than any other.

The Indian Trade Situation.

THE report on Indian conditions by Mr. T. M. AINSCOUGH, which we review in this issue, deals with the period immediately preceding the intensification of the political agitation in the country, and it must be read with this in mind. As Mr. Ainscough says in a covering dispatch, the situation only became really acute in April last. "The anti-British boycott campaign is now raging throughout most of India, and the future is still so obscure that it is not yet possible either to assess the agitation at its true value or to give any reliable estimate as to its permanent effect on British trade in India."

Had the events of the past few months not occurred we should have been inclined to take a somewhat optimistic view of the electrical trade position; indeed, it may yet be found that those events have not materially altered conditions for electrical activity. The country has enormous wealth and a population whose needs, though mainly primitive at present, must continue to expand. Some of these needs will be met by Indian producers, but for many years there must be an import trade of immense volume and electrical goods will continue to form an important section of the trade.

In many parts of India electrical development is proceeding—in some cases well ahead of the demand. The tendency will therefore be for demand to be assiduously cultivated, and in this work British manufacturers will take a leading part. In our issue of March 21st last (p. 542), we gave a brief account of a conference of representatives of the leading Indian electricity supply companies at which propaganda and development work were discussed, which showed that there is already an influential movement in existence. One important matter which came under consideration was the production of appliances suitable for Indian conditions and requirements. It was agreed that the supply companies should pool their experience and in co-operation with electrical manufacturers render such apparatus available.

Close co-operation of this nature necessitates that the manufacturers shall be represented in India, but a more cogent reason for representation lies in the augmented powers of the Indian Stores Department and the revision of the rules under which it operates. Manufacturers who have no representation and stocks in India will be at a considerable disadvantage when adherence to the rules becomes rigid and general. The larger manufacturers already have their subsidiaries or branches in India; for smaller concerns it is not an easy matter to deal with. There is a strong case for co-operation between the smaller makers of non-competitive lines whereby they could establish offices and stores, and efficient sales staffs, in the larger cities.

We commend the report to the earnest attention of the exporting side of our industry in the firm belief that, in spite of anti-British propaganda and intense foreign competition, we can maintain our position in the Indian market if the necessary measures are taken.

The Institute of Fuel.

LAST week we referred in our leading columns to one of the many points of interest in SIR DAVID MILNE-WATSON'S presidential address to the members of the Institute of Fuel. Another matter worthy of special comment is the growth of membership, which during the year increased by over one-third. Included in this increase were 90 students, and this raises a question as to their future standing in the Institute. The normal course under the Articles of Association would be for students on reaching the age of 25 years to be transferred to the class of ordinary members (for which no technical qualifications are necessary), as probably only

a minority would at that age have attained to the professional status necessary for election as Fellows. It seems to us that it would promote zeal for the acquisition of technical proficiency if students had the prospect of entering intermediately a class of membership for which an engineering knowledge of fuel problems was the accepted standard.

All-electric Public Lighting.

The President of the British Commercial Gas Association (Mr. H. Woodall) has expressed his annoyance that all over the country gas is being displaced by electricity for lighting the streets. With his view that electric lighting is less efficient, we, of course, do not agree, but we find ourselves in happy accord with his statement as to its progress. The Battersea Borough Council Highways Committee has now recommended the conversion of the only remaining gas lamps to electricity, and when this has been accomplished Battersea will join the 11 London and 40 provincial boroughs and towns whose streets are lighted entirely by electricity. A list of these is given in our " Notes " section; since its compilation the whole of Regent's Park has also been converted from gas.

Utility and Aesthetics.

In referring to the subject of rural electrification at a luncheon given by the Plymouth and District Branch of the E.A.W., both Lady Snell and Lady Astor, M.P., expressed the feelings of many country dwellers in giving their preference—if the difficult choice were forced on them—for the utilitarian advantages of electricity in the home rather than for the maintenance of natural beauty. Lady Snell also made fitting comparison between beauty in the home and beauty in the countryside. Both speakers agreed, however, that there was no need to sacrifice rural amenities, and we agree also, as we have often stated our belief that a properly-constructed pole line should not be ugly, and is just as suitable a part of the landscape as an oast-house or a windmill, even if it be devoid of the sentimental attraction that comes from antiquity.

Volumes and Values.

In last week's *Board of Trade Journal* the United Kingdom's overseas trade during the first nine months of this year was compared with that of the corresponding period of 1924, and to give a true picture of the position the figures were corrected to 1924 values. The result, so far as electrical goods and apparatus are concerned, is rather astonishing and suggests that, although the electrical industry is said to be the " one bright spot " in the clouds of industrial depression, there is very considerable scope for improvement.

Our exports of electrical goods rose from £7,213,000 in January-September, 1924, to £9,262,000 in the first nine months of this year. In the meantime, however, values had fallen to 90.9 per cent. of 1924 values and, thus, corrected to the 1924 value, the export total was £10,186,000, representing an increase of 41.2 upon the 1924 figure. At the same time, imports of electrical goods rose in value from £2,168,000 to £5,035,000, but as the price level fell to 72.6 per cent., the total corrected to 1924 values amounted to £6,932,000. Thus there was a rise of 219.7 per cent. in the January-September period of 1930 as compared with the corresponding nine months of 1924.

It may be inferred from this statement that we are importing a great deal of apparatus which could be made in this country, and that the increase has probably been due to the low prices at which foreign goods are offered. In the first nine months of this year there was a phenomenal rise in imports of meters and instruments to a total of £1,291,825 (against £262,634 in January-September, 1929). The value of imported insulated cables (excluding telegraph and telephone) was £705,024 (against £643,025), and that of telegraph and telephone instruments and apparatus £713,844 (against £1,106,379). Two other important items were glow lamps, £393,698 (against £274,750) and batteries and accumulators, £488,158 (against £522,178).

The E.P.E.A. Technical Groups.

The establishment by the Electrical Power Engineers' Association about three years ago of the National Technical Groups was a move of first importance. In the first place, there was urgent need for a platform on which supply men and manufacturers could jointly ventilate their every-day problems, and on which all, particularly the younger men, could express the uncertainties in their minds. Doubts were at first expressed in some quarters as to the advisability of establishing bodies which might be competitive with the Institution of Electrical Engineers. The Groups' discussions have worked well in parallel with those of the I.E.E., and, indeed, the newer organisations have proved to be complementary to the great engineering institutions.

While the I.E.E. leaves the door open to free discussion at most of its meetings, it is a fact that opportunities for discussion on the more practical every-day problems of the supply man are becoming less and less. The rapid advances made in electrical engineering demand increasingly the platform of the I.E.E. for the expert, and this in itself points to the need of such a medium for discourse as that afforded by the E.P.E.A. Technical Groups.

The results of the meetings have already clearly justified the formation of the Groups; the papers generally have been of a high standard, but at the same time of such a nature as not to exclude discourse by all members, junior and senior, and the discussions provoked have been full of life. Further, the formation of the Groups, and their subsequent activities, are proof positive that the Association is out to do some real good for the industry as a whole.

I.E.E. Students.

The new session of the London Students' Section of the I.E.E. opened last Friday with a most appropriate address by Mr. H. T. Young concerning the use of opportunities, which is summarised on a later page. It cannot be too strongly urged that Students' Sections themselves provide an opportunity for the young electrical engineer, whose wholehearted support of this movement is necessary for the good of the profession and industry as well as of the individual himself.

Assuming the possession of a sound theoretical and practical training, there is still another factor that is no less essential for success, and that is the development of a mental flexibility such as will enable the engineer to cope with new situations as they arise. The electrical industry is changing so rapidly, in the aphorism of Mr. Young, that the landmarks of yesterday may become the pitfalls of to-morrow.

The technical meetings, works visits, and social events arranged by the honorary officials provide opportunities of frank self-expression, of comparing views and experiences, and generally of acquiring the mental habit of " give and take " that is in itself an essential part of an engineer's equipment if he is to take his proper place in his profession and the world at large.

The Benevolent Fund Festival.

We are pleased to learn that there has been a very heavy demand for tickets for the annual festival dinner and dance of the Electrical Trades Benevolent Institution which will take place on November 12th. Captain J. T. Keeping, the Secretary, writes asking us to remind readers that Monday next, November 10th, is the latest date upon which applications should reach him. Those desirous of being present—ladies or gentlemen—should therefore at once forward the necessary guinea for a ticket. We hope that there will be a record gathering and a magnificent result.

Electricity in Stone Quarrying.

An Account of the Electrification of Workings at Southowram, Yorkshire.

THE electrification of stone quarries, at any rate as we know them in this country, and particularly in the West Riding of Yorkshire, involves general considerations not usually associated with most industries. Stone quarrying in Yorkshire may be considered as a mobile industry; there is a number of quarries scattered over the West Riding whose lives are comparatively short; after some ten or a dozen years from its commencement it is often the case that a quarry has to shut down, either because the supply of stone fails, or, because of practical considerations, its winning ceases to be an economical proposition. Electrification results in increased output, and therefore in shortening the life of a quarry. The procedure is usually then for the owners to open-up at another place where stone is available.

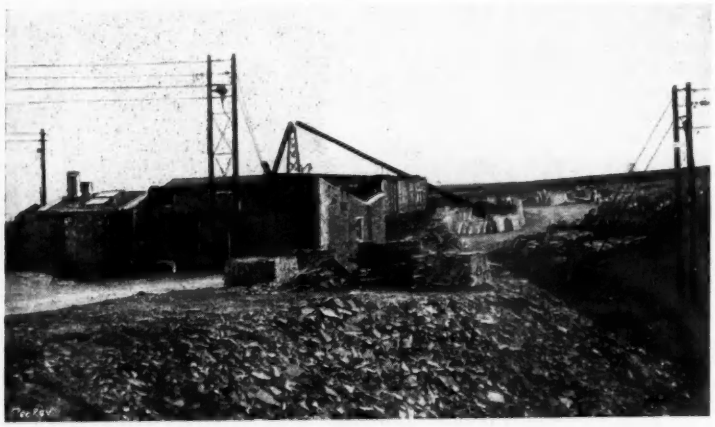


Fig. 1.—E.h.p. and L.p. Terminal Poles and Substation at Quarry.

With the foregoing in mind, we think that great credit is due to Messrs. S. Marshall & Sons, Ltd., on the step they took in electrifying their quarry at Southowram, near Halifax, a couple of years ago. Credit is also due to the Yorkshire Electric Power Co. for having made it possible for Messrs. Marshall to make the advance. This quarry is one of the first to be electrified in Yorkshire, and the Y.E.P. Co. feels that there is a big field for electricity supply in the stone-quarrying industry.

The output of the quarry is about 20,000 tons of geologically termed "Elland Edge" flag rock per year, which is used chiefly by London and provincial public bodies for paving footpaths, &c. The rock has also many uses in connection with building operations, and for speciality garden work.

Although the installed load may appear small, 100 kVA, the consumption of 10,000 kWh per month points to a very useful industrial load in the aggregate, especially as a considerable part of the plant runs continuously for 24 hours a day.

The stone exists about 60 ft. below the ground surface, an area of about 10,000 sq. ft. of which is first cleared. The useful material is then removed by drilling, splitting, quarrying, and mining, see fig. 7, and lifted to the surface by means of cranes and conveyed to the sawmills and yards, where it is cut to the required shapes and sizes. Before the quarry was electrified, the sawmills were driven by a gas engine, and the cranes by steam; hand methods were employed for the actual removal. The electrification scheme provided for the replacement of the gas engine driving the sawmills by an electric motor, the conversion of two steam cranes to electric working, and the installation of electrically-driven air-compressor plant, which has enabled the cruder methods of stone removal to be changed for compressed-air drills, chippers, &c.

There are three sawmills belt driven by a 50-h.p. motor. The actual frames, of course, work with a reciprocating motion, and the process is really one of grinding by means of steel grit, forming a sludge with water and the stone dust, between the steel blades and the stone. The frames will saw pieces of stone 10 ft. by 6 ft. by 6 ft., and each operates with an average of 20 cuts at one time. Fig. 6 shows the sawmill motor, and fig. 4 illustrates the front of one of the saw frames. The saw motor is started up on each Monday morning, and it runs continuously till noon on Saturday.

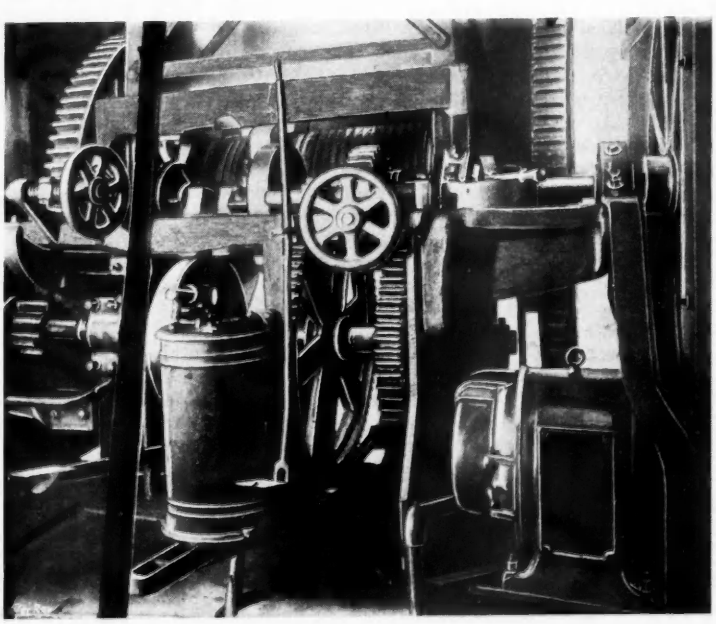


Fig. 2.—Driving Arrangements in Converted Crane.

A 40-h.p. motor drives an Ingersoll-Rand double-stroke compressor (10-in. stroke, 10-in. diameter), which supplies compressed air for five rock drills, two diggers, two chipping hammers, and one drill sharpener. The compressed-air pressure is automatically

controlled for operation between 75 and 80 lb./sq. in.

The conversion of the cranes from steam to electric working is of particular interest by virtue of the simplicity of the arrangements. Except for the removal of the cylinder (engine), the replacement of the flywheel on the end of the crankshaft by a gear-wheel, and the fixing of a 20-h.p. motor to the floor of the cab, driving direct to the gear-wheel, the driving arrangements are precisely the same as they were for steam working. The motor is controlled by an "Ellison" drum-type starter bolted to the framework of the crankshaft.

Fig. 3.—Cable Connection to Crane through Slip Rings.

Fig. 2 shows the driving arrangements in one of the converted cranes. The cranes are of the completely revolving type, so that overhead supply cables were not possible, and the difficulty of connection by underground cable was overcome by the simple slip-ring arrangements depicted in fig. 3. The armoured supply cable is carried in a groove cut into the surface of the foundation stone, and the conductors are terminated at the very simple brush-terminal block. From the slip rings secured to the crane spindle, v.i.r. leads are taken direct to the motor equipment.

The supply to the quarry is at 11,000 V by duplicate overhead lines from the Yorkshire Electric Power Co.'s system. The overhead lines terminate in trifurcating boxes on the H terminal poles, fig. 1, underground cables conveying the energy to the sub-station on the site, in which the supply is reduced to the working pressure of 400/230 V.

From the distribution board in the "power house" four main circuits issue, three by underground cable to the compressor, saw mill, and the saw-yard crane, respectively, and one by overhead line to a crane at the actual quarry working, fig. 5. Provision is made for the electrification of a further two cranes at the workings. The overhead to the second crane terminates at a pole a few yards away, and the connection is made by underground cable with similar arrangements to those employed for the first crane. The l.p. line, figs. 1 and 5, is a very simple affair; v.i.r. cables (bare neutral) are carried on ordinary pot insulators on wood poles.

It is always good to hear the spoken word of a satisfied consumer. Messrs. Marshall are very pleased with the results of their two years' working by the modern system. The cost of the electrical equipment has been covered by the economies made possible during the two years, and although there is no skilled, or even semi-skilled, labour (electrical) employed or at hand, troubles and inconveniences have been nil.

By the courtesy of the quarry owners we are able to publish the following very interesting information as to the economies effected by the electrical working. A steam crane costs for fuel alone 4s. per day, in addition to which there are water costs. The cost of electricity for working a crane is about 1s. 2d. per day. In the latter case there are no water costs, and owing to the simplicity of the electrical driving, the labour costs have been reduced considerably. The cost of running the compressor plant averages about 2s. per hour, and the result of the compressed-air working has been a great increase in the output of the quarry. The consumption cost for running the sawmills electrically works out at about 1s. 6d. per hour, and although this is somewhat more than was the cost of fuel for the gas plant, the labour necessary to stand-by the gas engine has been dispensed with. Further, with the gas plant there were many serious delays in getting under way, particularly on cold mornings; that is not the case nowadays. Consumption test figures taken for the various equipments are as follows: one crane, 1 kWh per hour; compressor, 1,176 kWh for 66½ hours' running; saw frames, for 82½ hours' running, 1,089 kWh.

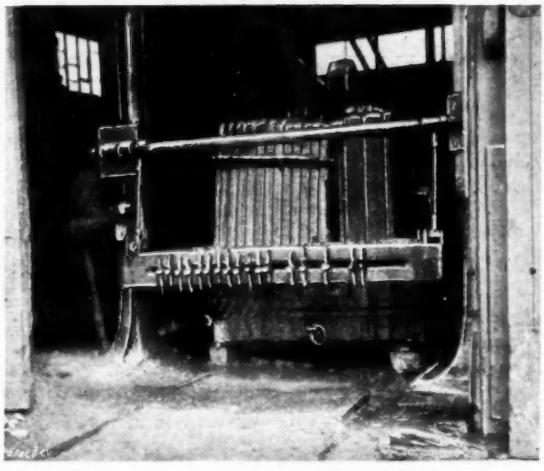


Fig. 4.—Front of Saw Frame.

The above figures, however, hardly represent the full economy of the electrical working, which is made possible by the judicious combination of the crane, mill, and compressor loads.

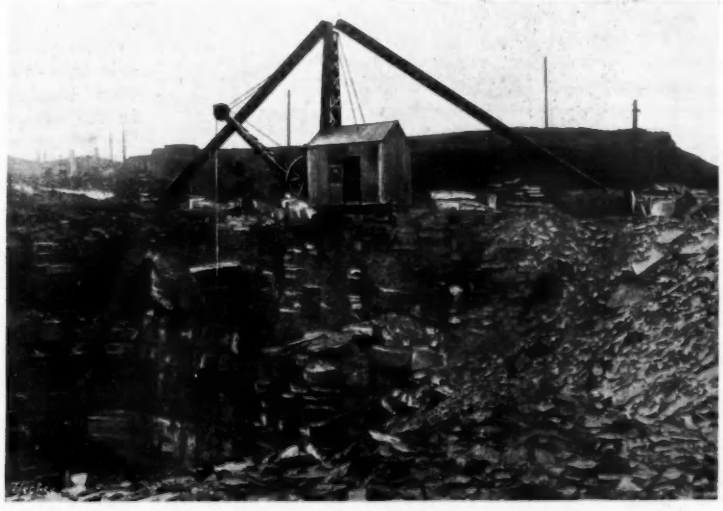


Fig. 5.—Electric Crane at Quarry Working.

The electrical installation work was carried out by

Messrs. G. A. Rix, and the conversion of the cranes from steam to electric working was effected by Messrs.

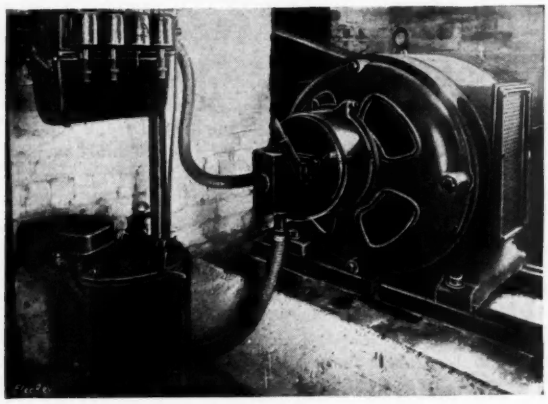


Fig. 6.—Sawmill Motor.

John Smith & Sons (Keighley), Ltd. All the motors were supplied by Messrs. Crompton Parkinson, Ltd.

We are indebted to Messrs. S. Marshall & Sons, Ltd., for permission to view the workings and to take photographs; and also to them and the supply company for their assistance in the collection of this information.

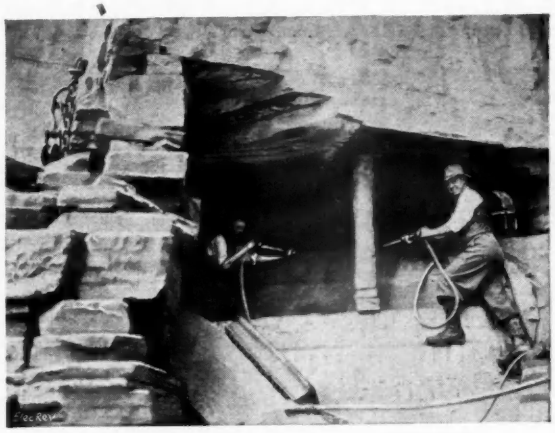


Fig. 7.—Mining Operations in Southowram Quarry.

Heat in Chemical Processes.

A Quick-starting Electric Oil Heater.

By C. H. S. TUPHOLME.

CONSIDERABLE improvements have lately been effected in the design of electrical heating plant for chemical processes, and systems have been devised which are particularly adapted to high-temperature high-speed chemical process and industrial heating operations where safety, economy, and close automatic heat control are required at working temperatures from 200 deg. to 800 deg. F. Each tank or kettle is a self-contained automatic heating equipment, operated at a suitable temperature and heating speed. Controlled heat in any quantity is available, and, as electrical energy is used only when the apparatus is in actual operation, stand-by losses are avoided. The heating efficiency claimed is 27 per cent.

When it is considered that the usual directly fired tank

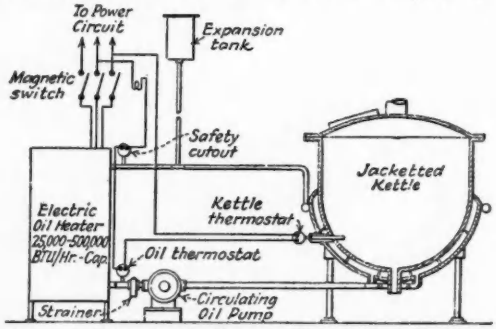


Fig. 1.—Electrically Heated Circulating Medium.

using oil, gas, or coke as fuel works at from 8 to 15 per cent. overall thermal efficiency, it is evident that, although the gross cost of electric heating may be greater than that obtained by other methods, electric heating equipment, due to its high factor of heat utilisation, the reduction of labour and maintenance expense, the increased production due to the higher temperatures and speed of heating, the operating convenience and safety, the reduction of spoilage, and the improvement in quality and uniformity due to its exact and automatic temperature control, should under usual conditions effect substantial reductions in overall production costs.

In some systems for working temperatures up to 550 deg. F., a petroleum compound is circulated through an electric oil heater and the jacket or coils of tanks, kettles, or other process equipment. The apparatus illustrated in fig. 1 is electrically heated by the container resistance method; the heating surfaces are operated at a low temperature differential between it and the oil, preventing the possibility of overheating or change in the oil, or injury to the electric heating equipment, thus eliminating all heater maintenance expense. A thermostat is placed at the heater outlet to regulate closely the temperature to which the oil is heated; a safety cut-out is provided to disconnect the electric current should the oil circulation cease, due to pump failure or other cause; and a strainer is fitted to remove any scale or foreign matter that may be in the oil and expansion tank.

In high-pressure steam or hot-oil circulating systems having a central heating plant and a large weight or volume of heating medium, the system responds slowly to changes in heat requirements; this results in considerable variation in operating temperature, and, when shutting down, the large amount of heat stored in the equipment and hot oil is lost by radiation. In the process outlined, the volume of circulating oil is relatively small, and under usual conditions the system is raised to the working temperature in less than ten minutes. It responds quickly to change in heat requirements, resulting in uniform operating temperature, and when shutting down the stored heat loss is negligible. The quick starting feature is of particular advantage where the equipment is used intermittently.

Where working temperatures above 551 deg. and up to 800 deg. are required, a high boiling point liquid, heated in a high-temperature high-speed vapour generator, can be used. This apparatus is heated by the container resistance method employing high rates of heat transfer, close automatic temperature control, and quick starting features. In this equipment no circulating pump is used, the condensate from the jacket or coils of the process apparatus returning to the heater by gravity.

In many operations, the cost of heat is only a small part of the total cost of the product, and any saving that will affect the high cost of labour, materials, or spoilage, or that will increase production, will repay many times a slight additional cost of heat.

The Future of Electrical Engineering.

Some Reflections for the Guidance and Encouragement of Engineering Students.

By J. ROSEN, B.Sc.(Lond.), M.I.E.E., and R. DOWSON, B.Sc.(Lond.), M.Inst.C.E.

(Mr. J. Rosen is a Director and Chief Electrical Engineer at the Heaton Works of Messrs. C. A. Parsons & Co., Ltd., and Mr. R. Dowson is Head of the Development and Research Department there.)

EVERY year a considerable number of young men enters the universities and technical schools to study for some career to be followed later in life. Some of these adopt engineering from a natural desire to make it their life's work; some are put to it by their parents' advice or wishes; while some avoid it and take up other studies from a conviction that the profession is already overcrowded, that "there is no money in it," and that the number of vacancies or possible appointments is dwindling owing to restricted trade and other causes.

Our Present Difficulties.

We, in this country, who have come to regard the world as our market, now find that elsewhere industrial resources have been developed and tariff walls set up against us. Where before we had markets overseas, our exports are now often shut out, and, indeed, goods that we could well make for ourselves are being dumped upon us from abroad, and so, in many industries, our factories are largely idle, or, at any rate, are working at reduced output.

In addition, the whole of Europe is immeasurably the poorer as a result of the Great War, and the capital available for new enterprise is strictly limited. In this country particularly, high taxation and the fixed level of wages, regardless of output, add to our difficulties in getting rid of obstructions to trade revival and in clearing the way to the reconstruction of industry, accompanied by real progress.

We have also the added circumstance that under schemes of so-called "rationalisation in industry," large combines are being formed, in which economy in men and material is being practised, and which for the present, at any rate, have the effect of still further limiting the market for the employment of newcomers in the shape of young men from the universities and technical schools.

These are some of the more obvious problems which naturally have a serious effect on the outlook of the younger generation.

It must in fact be admitted that in all industrial concerns the number of appointments for ordinary technically trained engineers is limited, and that the opportunities for promotion of the really capable junior engineers is still more limited. What these limitations will be in a few years' time, however, is another matter, and having summed up very briefly our principal difficulties, let us look at the other side of the situation.

What is the Outlook?

To begin with, we live in an age of applied science, originated by the discoveries of new facts in the nineteenth century. While many walks of life are static in the sense that they are non-creative and are dependent on the more vital occupations, our industries are dynamic in the sense that they are creative and must always progress and expand. It is because progress and expansion are the very essence of all industrial life, that electrical engineering is in constant need of young men and can absorb them in greater number than many other occupations. Yet young men are frequently advised to avoid industrial life on the ground that it is overcrowded. In more limited fields of activity, this may be true, but in creative work only to a much more temporary and artificial extent. It is because engineering, or applied science, is creative work, that it is most capable of expansion and offers more scope and opportunity for a career than all others which are non-creative.

Electrical Expansion Inevitable.

Bearing in mind these considerations, it is difficult to see what bounds there are to the potential expansion of electrical engineering in particular, and what there is that in the long run can prevent such expansion. Picture the world as it was in the time of Faraday, follow out carefully the ever-widening advances made with his great discovery of induction alone—leaving aside the work of a dozen other pioneer investigators—and then consider whether industrial depression due to political or any other causes can prevent expansion and progress along scientific lines. Is not the sum total of all the innumerable diverse pieces of electrical apparatus that can be bought to-day, and which we all use directly or indirectly, a proof of the irresistible advance of electrical engineering? We do not need, in order to clinch the argument, to attempt to visualise the discoveries and inventions, the development and ramifications of the application of electricity in the future, for although our prophecies and forecasts may or may not be true, it is as certain that there will be ever-widening advances as that the sun will rise to-morrow.

To-day it is well nigh impossible for a worker in any one branch of the electrical industry to keep in touch with progress and accomplishment in all the other branches of the same industry, and this is due to the vast fields that have been opened up by the untiring efforts of the members of the industry themselves. As these efforts are maintained and increased, so the industry expands and makes room for others. The idea that the edifice of electrical engineering industry is a closed inexpansible structure which can hold only a certain number of people and no more is manifestly incorrect, for, like the law of compound interest, the rate of increase depends upon the magnitude of the edifice itself at any instant. It is of a certain size to-day, but it will of its own accord be much larger to-morrow.

Openings for Trained Engineers.

Looking at the practical aspect of the problem, it should be realised that there are possibilities open to the trained engineer even at the present period of "marking time" in industry. In our own immediate surroundings there is great work proceeding in connection with electricity supply undertakings, which must eventually result in further scope for the use of electricity. In addition, it may be forecast without undue optimism that many of our main line railways will in time become electrified. All this means greater and greater ramification of power networks and the useful employment of increasing numbers in the manufacture,

operation, and upkeep of the plant. With the extensive use to-day of electric lighting and power, wireless, gramophones, telephones, and so on, these possibilities of future development and expansion become even greater.

For many young men who are confronted at the present time with the lack of scope in this country, there is a demand for trained men within the Empire, and to some extent abroad.

The Business Side of Engineering.

There is further a tendency, which has been steadily growing, to allow technically trained men to have a greater voice in the business side of engineering industry. In fact, it is found that engineers are employed not solely on technical problems, but young men with technical training later on in their careers take responsible positions in all departments, for technical men can more easily compete for the more responsible and better paid positions than those without such training. Hence it follows that many young men, who otherwise would serve an apprenticeship without any attempt to obtain technical knowledge, are now encouraged to go to college; in fact the staff of any undertaking whether in the offices or shops cannot be satisfactory unless it can draw upon a plentiful supply of young men with technical training.

As regards "rationalisation in industry" much doubt exists as to the results of large scale amalgamations in industry. Nevertheless, no matter what the final form which rationalisation may take, eventually industry must become more economically organised, better equipped with machines as well as men, so that for every position of authority and responsibility, the trained man will receive first consideration.

It must not be forgotten that all large organisations in every field of industry have departments for purchasing, manufacturing, sales, development and research, &c., which to-day provide opportunities for young men of training—whether university or secondary school or trade apprentices—which were undreamt of at the time when those at present responsible for the conduct of industry began their own careers.

Zeal Essential to Success.

Nevertheless, let no young man, if it can be avoided, take up engineering work unless he has a natural inclination for engineering. If he is not deeply interested in it and is forever wishing that he was doing something else, he does himself and the industry harm. Again, many of those who feel an aptitude for such work are prone to look upon a post mainly as a means of individual advancement by single-handed accomplishment. There is, however, no such thing as single-handed accomplishment in modern industry, and the ability to co-operate with others is essential.

This is a quality of vital importance, which cannot be fostered too carefully, for success in competition with others is not the highest object of an engineering training. The secret of great collective accomplishment is untiring industry of the many as well as bold imagination of the few. Individual brilliance does not forward the development of a great industry without the added effort of countless steady workers. In fact, although it may be true to-day that individual success is open to labour and merit and to nothing else, the "merit" includes an attitude of mind towards engineering as an industry rather than as a profession.

The keynote of a man's influence should be helpfulness. It is not enough for a young man entering upon industrial life to be well equipped in scientific and technical knowledge. He must be capable of taking an active intellectual interest in the work of his company, and zealous in the execution of his duties. He must have a firm belief in his own work in particular and must keep his mind open for those progressive changes which will benefit the industry in general.

Photo-electric Cells.

An Account of Some of their Industrial Applications.

By T. THORNE BAKER, A.M.I.E.E., F.Inst.P.

(*Concluded from page 723.*)

A circuit shown by W. Edwards & Co., with one-valve amplification, is indicated in fig. 6; an accurate type of milliammeter can be used in such a circuit (with a gasfilled cell), and photometric work of considerable accuracy carried out.

Various types of photometer are in use with a photo cell as the sensitive element; there are, for example, the density reading instrument of Dr. F. C. Toy, which is in use by many photographic manufacturers for reading densities of silver deposits for speed determinations and emulsion characteristics, and photometers for comparing the brightness of narrow strips of the spectrum in spectro-photometry, and for estimating the strength of illumination in turbidimeters and nephelometers.

In the photometry of lamps a bridge circuit as shown in fig. 7 is recommended. The two valves are selected with their characteristics as similar as possible; their resistances are about 10,000 ohms, R being about 1 megohm. By varying one or both of the grid biases, E_{g1} and E_{g2}, or the ratio of the valves, the bridge can be balanced so that the galvanometer registers zero when there is no light on the cell. The current recorded by the galvanometer will then be practically proportional to the intensity of the light.

An apparatus designed by G. T. Winch, of the General Electric Co.'s Research Laboratory, involves the use of two photo cells, respectively blue and red-sensitive (potassium on copper oxide and plain potassium) on the arms of a Wheatstone bridge, with an electroscope as indicator. The cells are housed over each side of an integrator, in the interior of which is placed the lamp to be tested, and the colour temperature of the filament and luminous output are deduced from measurements of the sum and ratio of the photo-electric currents.

A new direct-reading photometer likely to prove of importance is the light-intensity meter designed by the Westinghouse Lamp and Westinghouse Electric and Manufacturing Companies for use in cine-studios. Some more accurate value of the light in studios is badly needed for the guidance of the "camera man" in estimating his exposures. The meter is self-contained, and consists of a shielded photo cell and a portable microammeter calibrated directly in foot-candles. A special type of cell is used, which is stated to have a very broad response covering the visible spectrum. The instrument is scaled to embrace a range of 100-3,000 foot-candles.

Another type of portable photometer has been recently designed by the General Electric Company; in this circuit the current is kept constant, and the change in voltage across the cell used to effect the measurement. It can be used in turbidity measurements or for the detection of light scattered by smoke, and so on. Its

sensitivity is so great that an illumination of less than 0.0001 lumen is readily detected.

Important results have been obtained by Dobson at Oxford in measuring the amount of ozone in the upper atmosphere. He compares the strength of narrow bands in the ultra-violet spectrum of the sun, their wavelengths being chosen so as to have one of them strongly absorbed by ozone and the other but little absorbed.

A recent industrial application of interest is the use of photo-cells to record the opacity of paper during its manufacture, and so to check automatically its thickness and uniformity.

The photo cell is used to measure light intensity in the various systems of photo-telegraphy and television,

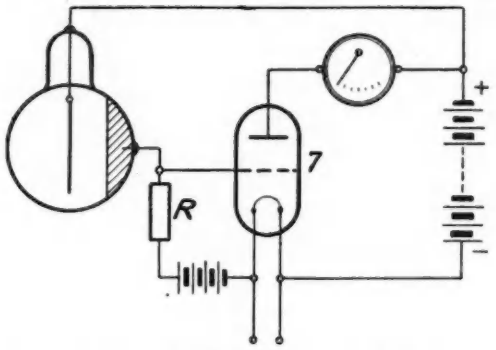


Fig. 6.—Circuit with One-valve Amplification.

as also in sound films or " talking pictures." In the Karolus-Telefunken system, the light beam before being concentrated upon the photographic image is interrupted by a rotating toothed wheel in order to make it intermittent. It is thus readily converted on valve amplification into an alternating current of a few hundred cycles, which is impressed on a carrier wave of about 1,400 cycles; this is transmitted over a ghost circuit on the ordinary telephone system.

The extraordinarily rapid response to light of the cell, and its almost entire freedom from lag, make it respond instantaneously to the changes in density of the travelling photographic image, and it is this instant response which has made the telegraphy of pictures so wonderfully accurate. The General Post Office in London has succeeded in transmitting the finest newspaper print

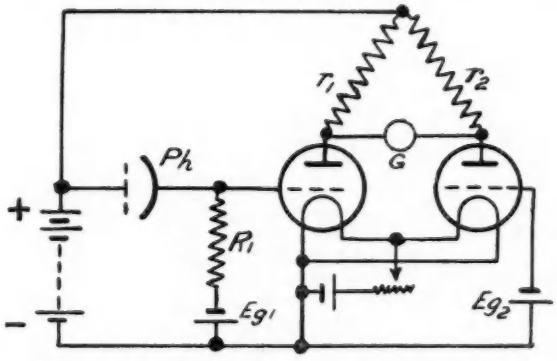


Fig. 7.—Bridge Circuit for Lamp Photometry.

between London and Berlin, and has recently opened up communication with many foreign capitals. An area of 10 in. × 7 in. can be telegraphed in 16 to 20 minutes with dead accuracy and freedom from distortion.

Television makes yet greater demands on the photo cell, because the living image must be scanned sixteen or eighteen times a second in order to give an animated picture on the receiving screen. Many special types of photo cell have been designed for television work, notably the ten-inch long tubular ones used by Dr. H. E. Ives in the system of the Bell Telephone Laboratories, three of which are fitted round the frame before which the person to be " televised " sits. A pencil of light is directed by the scanning mechanism on to the face, traversing the whole area in 1/18 second, and the light reflected from the features (or subject) is collected by the cells. Quite recently new types of cell, sensitive, respectively, to blue-violet, green, and red, have been produced which, worked in three separate circuits, have solved the problem of natural colour television; the three currents as received from the cells are made to actuate gasfilled lamps which illuminate the viewing screen and which themselves, when filtered, give light of the respective primary colours.

The demands made on the photo-cell by talking pictures are perhaps yet greater, because, with an instant response to light changes up to frequencies of 20,000 per second, we must have a true illumination/current relationship over the whole range of light intensities offered by the photographic sound record.

In conclusion, some reference should be made to such cells as the cadmium photo cell supplied by Messrs. Watson (Electro-Medical), Ltd., for the purpose of measuring the amount of light used in therapeutic treatment. Medical men employing either ultra-violet or visible light have been at some disadvantage through not having adequate means of estimating the character and the quantity of light applied to patients, and the photo cell is now being adapted to this important work by a number of investigators.

It will have been seen that the function of the cell can be probably divided into two parts, one to measure light intensity, the other to set a relay in action merely because there *is* light, or there is not. It is many years ago now since electric buoys were automatically lighted at sunset and extinguished at sunrise by means of selenium cells; it is hardly necessary to say that the photo cell will tend to make this operation more certain. The " light on or off " effect has been applied to ringing alarms if a doorway is darkened by the passage through it of a burglar or unwarranted person, to signalling the passage of a motor car past some point on a speed track, and more recently to the actuation of textile machines by means of stencils through which a ray of light can pass and so reach a sensitive element.

As an example of the kind of apparatus which is coming into existence, the " Osram " photo-cell amplifier of the General Electric Co., Ltd., may be quoted. This

Fig. 8.—Automatic Lighting Controller.

unit, shown in fig. 8, employs a single-valve amplifying circuit, and operates on a.c. or d.c. circuits of 200 to 240 volts.

When the photo cell is kept dark there is, of course, almost perfect insulation between its electrodes, and a current of several milliamperes flows in the anode circuit of the valve and through the operating coil of a relay holding the contacts in the " on " position. When the cell is illuminated, the emission from the cathode charges the grid negatively, reduces the anode current to zero, and the centre contact of the relay being released springs back to the " off " position.

One type of this unit has a glass-cover and is specially suitable for automatic lighting control.

After-Sale Service.

How a Reputation can be Made or Marred.

By A. J. SMITH.

The Indictment.

"One of the greatest drawbacks attending the sale of British goods is the difficulty of obtaining replacements. While the American maker recognises the necessity of a prompt and efficient spares service and provides accordingly, the British manufacturer is too often apt to assume that his goods will never need any replacement, and consequently fails entirely to make the slightest provision for it."

THE foregoing, or words to a similar effect, can be read in almost any Consular report, can be heard at any business luncheon, can be learned from any publication issued by any Chamber of Commerce, or from the propaganda of any of the trade promotion experts of various kinds whose business it is to decry the British manufacturer and all his ways! The danger of this constant querulous harping upon wholly imaginary drawbacks is that by dint of repetition both the British public and the world in general are becoming convinced of its truth. The plain fact of the matter is that the average manufacturer is far too wide-awake for there to be any difficulties whatever over the production of replacements. On the face of it, it is difficult to understand what precise trouble is likely to attend the production of such parts which in the very nature of things are usually merely drawn from current stock or production.

Justification or Otherwise.

This is not to argue that trouble may not occasionally be experienced by the ultimate buyer or user, but where this occurs it is seldom or never due to any failing on the part of the maker. Such trouble is mainly experienced in trades transacted through the medium of a dealer, where the real user does not come into direct contact with the manufacturer, but only with an agent or trader. The following instance is typical of what is occurring every day in almost every trade:—

Happening to require a replacement for a certain appliance, the writer asked the dealer handling this line how long it would take to procure such a part and the price, only to be told in reply that it was practically impossible to obtain replacements, and that in any case the makers would require about seven months for delivery. Knowing the makers in question to be a very large and very business-like concern who advertised largely, the writer was sufficiently doubtful upon this point to write and put the case before them. By return of post, he received full information as to the price and the catalogue number of the part needed, with the assurance that any possible replacement part could be instantly delivered from stock. The makers further expressed some surprise that any statement should have been made regarding possible trouble over delivery, as the trade in general knew that they made a very strong point of the supply of spares. With the object of eliminating any further trouble, they then gave the name and address of an agent in the district, describing him as an enterprising trader who would be only too pleased to procure any such replacement immediately. Curiously enough, the enterprising dealer was the one who had made the original assertion about the impossibility of obtaining delivery!

Service to the Community.

Seeing no alternative, the writer sent the local agent a written order giving a complete description of the part needed, its catalogue number, and price, and after a decent interval inquired about delivery, only to be faced with a request for "further particulars." These, it appears, would consist of a detailed drawing of the part required, as the makers had made so many changes in design that they could not supply anything without this. The dealer also expressed a doubt whether the appliance was really a product of the makers referred to, and, in conclusion, he gave it as his opinion that it was possible he might know something on the subject of delivery in about a week's time, providing he could get a reply from the makers.

After the requisite interval, another attempt was made to secure delivery. Strangely enough, the dealer stated that he had only telephoned to the makers again on the subject the previous day. (Incidentally, the cost of such a telephone call was 3s., and it speaks volumes for the value of the services rendered both to manufacturers and users that dealers can be found who will go to such an expense in their endeavour to smooth the path of the buyer!) Unfortunately the expense and trouble had been unavailing. The makers, he affirmed, could only repeat to him that they could do nothing in the matter without "further particulars." Pressed to define exactly what these further required details could be, the dealer was at first somewhat vague, but in a sudden inspiration he suggested a dimensioned drawing, the catalogue number of the part, the nameplate number and the date of manufacture of the appliance. Warming to his subject, he stated that the whole appliance (which he had not seen) was entirely out of date, and that the purchase of a new one was advisable.

The Sequel.

A letter to the makers with a copy of the correspondence and conversations with their enterprising agent brought delivery of the part required immediately, showing that there was no difficulty attaching to the matter. The disquieting feature of the case, however, is the fact that a maker's reputation is at the mercy of the whim of a dealer, and untold harm is being done daily in numerous trades by practices similar to those described; for if the ultimate buyer is merely one of the great general public, it is seldom he has either the inclination or the determination to persevere sufficiently to obtain what he wants, and in too many cases he is apt to be satisfied with the facile but wholly erroneous explanation that the maker concerned cannot supply replacements or service his product in any way.

Is Trade Wanted?

It may be argued that the majority of dealers are too badly in want of trade to jeopardise the loss of even such turnover as is represented by the supply of spares. A lengthy acquaintance with the average trader, however, will usually give the impression that, while he wishes to secure all the business he can, it is only for precisely the class of goods that he thinks the public should desire, and those that can be handled without any trouble. A possible sale which would involve any correspondence or the procuring of an article which is not in stock is regarded as a thing to be avoided at all costs, the reasoning being that it is far easier to make an excuse than to write a letter. When such an attitude is encountered on the part of the actual trader who has an interest in building

up a permanent goodwill, one can imagine how much stronger is the impulse to make a similar excuse on the part of assistants.

In other cases the reason will be a mistaken notion on the part of a dealer that in refusing upon various plausible pretexts to handle replacements he is thereby building up a larger business for himself in new goods. This reason is undoubtedly erroneous; but whatever the cause, it is certainly unfortunate that the blame for all the resulting annoyance and inconvenience should invariably be laid at the door of the maker, and it is the daily repetition of similar incidents in many trades which, in the process of time, has built up the firmly rooted belief, both at home and abroad, that the British manufacturer is totally unable to service his goods by the supply of the simplest of replacements.

Electricity for the Home.

Some Remarks on Electric Water Heating, with Particular Reference to Heat Losses in Pipes.

By H. EDWARD.

FROM the numerous advertisements which appear week by week in the electrical papers it is evident that makers of electric water-heaters are becoming more and more alive to the enormous possibilities of this method of getting hot water. This is as it should be, as this heating agency is, of course, ideal, but I think there is much more to be done before a really wide extension of its use can be expected.

The position with regard to these heaters is, from my own observations, very much akin to the case of electric cookers; *i.e.*, possible users, while admitting their benefits, are held off by the fear of high running costs. While my experience with an electric cooker has shown me that this fear is really unfounded, I am bound to admit that there *is* quite a lot of ground for the argument in the case of the water heater—at any rate, where the charge for electricity is about one penny per kWh or higher. (I am speaking now of heaters installed in the general house supply, and not of those used for local supplies only, such as for the bath or sink; as stated below, my argument does not apply so much in these cases.)

My first incursion into the realms of electric water heating was with a device which heated water *from the outside* of the tank. An insulated element was clamped tightly round the tank, and, although this is obviously an inefficient method, the results obtained were surprisingly good. Two good hot baths per evening could be obtained at an average cost of about 2½d. per bath, but (largely owing to the absence of lagging) the water took rather a long time to get hot, and cooled off rapidly when the current was switched off, and we eventually decided to put in a tank with thermostatic control.

This is a really nice job, and functions perfectly. The snag is that the heat losses are much higher than was estimated, working out, as proved by careful tests, at about three kWh a day, whereas when the probable costs were gone into before installing the heater a loss of 1 kWh a day was allowed, this figure having been obtained from two or three different sources. Unfortunately, these authorities did not make it clear that this loss *only referred to the tank itself* and made no allowance for any pipe work. Possibly this is obvious, and it is easy to be wise after the event, but I suggest that it is a trap into which many people might fall, and I consider that this point should be made clear to prospective users of electric water heaters.

The obvious remedy for this state of affairs is to lag the pipes, but this may easily prove very expensive; in my own case, a good deal of pipe work is involved and the cost of really efficient lagging would probably be so high as to wipe out many months' saving in electricity due to the reduced radiation loss. I am still endeavouring to find some means of lagging which will be (1) inexpensive, (2) reasonably efficient, and (3) capable of application without damaging decorations. This aim is probably unrealisable, and in the meantime we are not having the full benefit of the thermostatic control, since a loss of some 14 kWh a week in excess of that anticipated, in addition to the cost of heating the water used, is a matter of considerable moment, even at one penny per kWh.

It is clear that where economy is important this question of heat losses should receive very careful attention, and I think that electricians and others who have to advise people on these matters should not endeavour to minimise the point, as it is far better for the industry as a whole for consumers to be quite satisfied from the start.

In cases in which the high cost of the heat losses is not very important to the consumer, a water heater of this type is simply ideal. The thermostatic control ensures as near a constant supply of hot water as could be wished for, and the complete absence of work, worry, and trouble is a tremendous boon. But where the saving of a few shillings a week demands consideration, even this freedom may be thought to be too dearly bought. It may be found, on taking into account the layout of the pipes and all other considerations, that it would be a better proposition to have a small tank (say 1½-2 gallons) in the scullery and a large one in the bathroom, instead of one tank for general house supply. This scheme has the advantage that the pipework (which from all appearances seems to be responsible for at least one half of the losses) is limited to the incoming cold water supply, as the outlet would be just a short length of pipe straight into the sink or bath (and hand basin). On the other hand, the initial outlay would be much higher, naturally; evidently the matter would need to be carefully thought out before the best arrangement could be found.

Of course, in places where specially low rates are in force for electricity used for water heating, the foregoing remarks lose a certain amount of their force, but so far as I am aware a charge of one penny per kWh, or higher, is far more common than any lower price.

These remarks deal with electric heaters of the self-contained type, with heat control, but the question of losses would still be present in the simpler types, such as a tank with a plain immersion heater, and, without automatic control, much of the benefit of this method of heating is missed.

I cannot help feeling that most manufacturers and supply authorities overlook the fact that, whilst there is still (even in these days!) a good number of wealthy people, the largest potential market lies among the class of people who, from inclinations of taste and training, desire to indulge in these electrical devices, realising the benefits which may be obtained from them, but who are only too often prevented by (1) the first cost and (2) the running cost. There seems to be little in the contents of, for instance, a thermostatically-controlled water heater to justify the high prices which are usually asked;

I suppose the makers would say that the sales were at present so small that they could not afford to market their goods at a lower price until the sales were larger, while the supply authorities would no doubt contend that with such high overhead charges, &c., it would be impossible to sell power at cheaper rates, at any rate until the demand was greater. This may be all very true, but the would-be consumer's plea is equally excusable:—"I cannot afford to have these appliances while they cost so much to buy; you reduce the price, and *then* I shall be only too glad to go ahead and install this, that, and the other 'gadget.'"

It is this "vicious circle" which, in my opinion, is making progress in domestic electrification much slower than should be the case, and, until someone makes an effort to break away from the present state of affairs and substantially reduces the prices of many of the electrical appliances, I do not see how other than slow progress can be looked for.

That the running costs of all electrically-worked articles are *necessarily* high is a fallacy which seems to take a great deal of shaking. Given a reasonable charge for current, most devices are *not* expensive to run, contrary to the popular belief; cooking is a very good example of this error. Water heating, as I have said, *does* come rather heavy, at one penny per kWh or more, but the cost is chiefly high owing to heat losses, and I do not think that the expense for the *hot water used* is unduly high, even at this figure, when the saving in labour and decorations is taken into consideration.

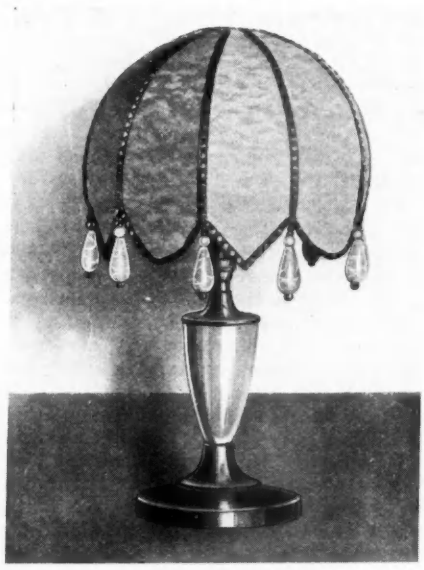
Unfortunately, there are very many people who are not in a position to let the saving in labour compensate for the extra cost, and anything which can be done to enable them to participate in the benefits of domestic electrification will ultimately and inevitably react to the advantage of everybody concerned in the production or sale of electrical appliances for the home.

The Large All-electric House.

Speaking at last week's meeting of Messrs. Drake and Gorham, Ltd., Mr. Hamlyn Drake said that there were two reasons for his decision to make extensive use of electricity when carrying out the necessary repairs and alterations to his house at the beginning of his tenancy. In the first place, he found the capital cost was lower than with other systems, and in the second he was anxious to gain first-hand information on the subject which would be of value to the company and its clients. Hitherto the main development of the all-electric house had been in small houses where no servants were kept, and the figures obtainable from manufacturers were naturally based on the experience gained in that type of service. It was important to know whether these figures held good in such establishments as his own, and if not, to what extent they needed modification. His experience had proved most satisfactory, however, and, he hoped, useful.

A New Table Lamp.

The table lamp illustrated herewith, which has been introduced by Moulded Products, Ltd., Chester Road, Tyburn, Birmingham, affords a useful and attractive



An "M.P.L." Table Lamp.

table decoration. It is made in a variety of colours, and it gives an opportunity of selection to tone with existing surroundings. The lamp is supplied in standard bakelite colours, and finishes of old gold, antique silver, and copper may be provided. Each lamp is supplied complete with 6 ft. of flexible lead and a lamp adaptor.

Prevention of Accidents.

The alternatives of insulating or earthing electrical apparatus are held to provide in many cases inadequate safeguards against shock. It is claimed that a solution of the problem is to be found in the automatic disconnection of apparatus before current leakage can cause a dangerous potential to be reached.

By T. C. GILBERT, A.M.I.E.E.

IT has long been a source of wonder to the writer that the question of electrical safety should apparently receive so much greater attention on the Continent than it does in this country. With our proposed great schemes of rural electrification in view, and with intensive development in the domestic sphere at hand, the time would appear to have arrived when all sections of the electrical industry should consider means of obtaining fuller protection for the ignorant user of electrical apparatus.

Granting that the list of electrical fatalities has not yet reached alarming proportions, what steps are we taking to prevent it doing so? We should at least put ourselves on the same level as other countries, and, if necessary, profit by their experience. We must review our existing safety measures, and if they are found wanting introduce new and more effective methods of protection, as has been done elsewhere, and in no half-hearted manner.

Mere blind observance of rules and regulations, whether for house, factory, or mine, will not greatly affect the safety question; the practical engineer looks further than this and asks himself "What will happen if my protective arrangement fails?", or "How will this behave under abnormal conditions?" Our multiplicity of rules and regulations are professedly framed to secure the safety of the user, but undoubtedly the question of safety, *qua* safety, does not receive the attention

that it should, which it warrants, although the observance of regulations is probably more complete to-day than ever before.

Direct and Alternating Currents.

The reason for this may be that electrical engineers generally do not realise the possible dangers in a universal 230-volt a.c. supply. After our many years of d.c. supplies we are inclined to treat 250 volts as of no great account, and certainly accidents on d.c. circuits at this pressure have been few and far between. The report of H.M. Chief Inspector of Factories and Workshops for 1929 contains a typical instance of this frame of mind, an engineer on the staff of an important electricity supply undertaking actually stating at an inquest that he did not consider 250 volts a.c. a dangerous voltage.

As this article was written following a perusal of the 1929 report, frequent references to it will be made; the whole report refers again and again to the inherent danger of low-pressure a.c. supplies, which has also been the case in previous reports. In this, the only official record of electrical accidents, the Chief Electrical Inspector says " It is becoming increasingly important to guard against the possibility of shock. The difference between the danger of a d.c. low-pressure shock and one from a.c. is by no means yet generally realised, particularly by people who have been accustomed to dealing with d.c., or even by people who, by virtue of their responsible positions with regard to the safety of others, ought to be fully cognisant of the facts." Twenty-one persons were killed in factories alone in 1929 on low-pressure a.c. supplies, in spite of enforceable regulations and efficient inspection, so that it is reasonable to assume that in the vast projected extensions of electrical services in this country many accidents will occur unless the safety question is adequately tackled in advance.

Safety can hardly be compatible with cheapness, and the great obsession of the electricity supply industry to-day seems to be cheapness. Cheap electricity flowing into cheap installations, too often nasty dangerous installations, and operating inadequately protected apparatus, will not make for true electrical progress, and is a short-sighted policy. A few really serious accidents to domestic users, and the whole electrical advance may be held up indefinitely; cheap electricity may prove to be very dear electricity in the long run if reasonable safety precautions are not considered to be of an importance at least equal to the design of a cooker.

Readers of the glowing descriptions of various domestic electrification schemes cannot fail to have noticed the many examples of extremely bad electrical practice, considered from the safety aspect, which are apparent from photographs of these schemes. Safety for the user has certainly never entered the heads of the engineers concerned in some of the cases that I have myself noticed, and I need mention one instance only, which appeared in the Electrical Review for January 17th, 1930. I am not suggesting for one moment that all applicable rules and regulations governing the installation of this apparatus have not been rigidly observed, but, even so, safety has not been achieved. It is fairly obvious from the descriptions of these various schemes that connections and sales of electricity are the main concern of the undertakings mentioned, but I do suggest that if many arrangements are being made like the one illustrated, then the electrical industry will be the better off in the long run without some of the intensive domestic developments that are now taking place. Even if adequate safety arrangements meant another farthing on the rate per kWh, surely the avoidance of accidents would be worth this amount. I hope to show later on, however, that safety can be practically assured at certainly a much less cost than even this.

Rural developments, too, present their particular problems, and the question of the protection of rural installations is rather more involved than that of town installations. For instance, in an article entitled " Safety in Rural Electrification " (*Electrician*, May 16th, 1930), Dr. Alfred Ekstrom, M.I.E.E., states that pressures as low as 10-20 volts are fatal for cattle, and this point will have to be carefully watched in schemes for rural electrification. The loss of a few cows to a farmer may conceivably adversely affect the complete electrification of a district, with serious financial loss to the undertaking, and may even result in compensation claims against the supply authority. The point will be further gone into later on in this article, but, apart from any question of risk to human beings, the possibility of accidents to live stock will be of considerable importance on farms, especially as animals seem to be more susceptible to shock than human beings.

To return to my point that electrical safety receives greater attention on the Continent, experience in public supply in Sweden has shown that the number of fatal accidents caused by 220 volts a.c. to earth was eight to ten times as many as at 127 volts a.c. to earth (calculated per million inhabitants connected at each voltage), and it was therefore considered inadvisable, in spite of the technical advantage, to extend the higher voltage. Supply is given to domestic consumers in Stockholm from 2 phases, 220 volts, but the neutral is not at present in use, although it is brought to the main fuses in the house. The pressure to earth is, therefore, only 127 volts (*Electrician*, August 15th, 1930). If in the future the *insulation* (the italics are mine) of domestic appliances is sufficiently improved the proposal is to increase the voltage to 380/220 volts; in fact, the substations are already equipped to enable this to be done. This forethought probably means slightly more expensive electricity in Stockholm. Many Continental engineers are frankly horrified at our proposal to standardise a.c. at 230 volts, but undoubtedly it is here to stay, and our only problem is to evolve sufficiently adequate safety measures to discount its dangers, which is surely not an impossible task.

I should perhaps make it clear that I am considering only protection from shock, and taking no account of fire, burns, or what is known as " eye flash." The risk of fire, burns, and eye-flash is probably greater on d.c. than on a.c. supplies, and the Factory Report for 1929 confirms this. Of 139 d.c. accidents, burns and eye-flash accounted for 125, while of 141 a.c. accidents they accounted for 44 only. I also think we can consider the fire risk decreased by the use of a.c., owing to the absence of electrolysis. The only remaining risk is, therefore, one of shock, which is undoubtedly accentuated.

Intensity of Current.

According to the Electrical Review of January 27th, 1930, the French technical journals have recently given prominence to electrical accidents, their causes, and means whereby they may be avoided. " In *l'Electricien* of June 15th, 1930, an article on the subject deals with the physiological action, it being stated that, contrary to the general impression, it is the intensity of the current traversing the human body that deranges its organisms, and not the voltage. Apparently Ohm's Law may be applied to the human body as to other resisting conductors, although momentary variations may produce important differences. A man in a state of perspiration offers a superficial conductivity which will cause the current to keep close to the skin, whereas if the person's skin is dry and he has his feet on wet soil and his hands have been recently washed and soaped, a grave risk is run if an electrical conductor, or badly insulated apparatus, be touched. These conditions are comparatively frequent, for many fatal accidents have occurred at the French domestic voltage of 110 volts.

The article goes on to say that a normal human being may support a current of 18 to 35 milliamperes without harm, but those figures doubled may be fatal, particularly if the victim's heart is faulty, and it appears from investigations of many fatal accidents that a current of 80 to 150 milliamperes is always fatal. The precautions recommended are: (1) efficient insulation from earth, and (2) all electric hand-lamps, machine tools, laundry irons, curling tongs, hair-dryers, all forms of cooking and heating stoves, and all electrical apparatus

adjacent to baths and shower-baths, should be fed with a.c. through transformers at a pressure of not more than 25 volts.

An article in the *Revue Generale de l'Electricité* states that research work has been carried out in connection with electrical accidents, consequent on the increasing employment of electricity in France and its introduction into rural districts. In order to reduce the number of accidents which occur in France from electrical causes, the Minister of Public Works has created a " Committee for the Prevention of Electrical Accidents," comprised of representatives of the various Ministries more or less concerned with electricity, with the addition of representatives of the generating companies and members of their staffs (Electrical Review, August 20th, 1930).

This recommendation to use lower voltages, especially as low as that stated, cannot really be considered a satisfactory safety measure, as its use must be practically restricted to the small appliances mentioned. It cannot be extended to radiators or other heavy-current consuming appliances, owing to the magnitude of the resulting currents, and, although the risk of shock is reduced or eliminated by this means, the risk of fire and burns is immeasurably increased. It is possible, of course, to construct the heavier apparatus with self-contained transformers, in the same way that one of the " Revo " cookers was equipped to reduce the voltage to the boiling ring, but this does not get over the trouble of the higher-voltage supply to such apparatus; also the question of portability is seriously affected. It is interesting to note, however, that according to the 1929 Factory Report, mentioned above, experiments were made by the Home Office with a view to finding what pressure could be used without protection of any kind to the user. It was found that 25 volts was the maximum that could be utilised with portable tools, the operator " shouting that he had had enough " when this leakage pressure was reached. In view of the drastic condition of the test, I consider this unknown hero was lucky to be able to shout at all, and it would be interesting to know the actual currents traversing this man's body at the time. Had he been working on, say, the top girder of a building, even this pressure might have had serious consequences.

In this connection also, the V.D.E. (Federation of German Engineers, corresponding to our Institution of Electrical Engineers) has established that the maximum a.c. voltage to which a human being, or animal, should be exposed is 42 volts, and that fatal accidents have actually occurred at voltages lower than this. The Federation, has, therefore, recommended that steps be taken to ensure that as soon as the outer metallic casings of any apparatus likely to be handled in the home, the factory, or elsewhere, attain to a potential of anything between 20-42 volts, due to current leakage, the apparatus should be immediately automatically disconnected from the source of supply. In consequence of this recommendation a system of protective switching of great efficiency is in use in Germany, and this will be more fully described later on in this article. It is sufficient to say at the moment that this protective system appears to be capable of providing far superior protection against shock than the three methods generally in use in this country (insulation, earthing, and connection to the neutral) all of which exhibit serious shortcomings in one direction or another, even if the most conscientious efforts have been made in their application.

We thus find that really serious attention is given to the subject of electrical accidents in the three Continental countries in which electrical development has reached a very high level, and is probably the outcome of their experience of the extensive use of a.c. supply. As our greater development in this direction has yet to come, we should undoubtedly profit by their experience, and reconsider our established ideas regarding electrical safety without delay. How do our methods of protection cover the findings of the French and German technicians, that 80 milliamperes represents a fatal current and that we must not expose our relatives to more than 42 volts a.c.? A brief examination of these methods will show us that to all intents and purposes we are not completely covered at all, and we appear to have no remedy beyond disputing the above conclusions on the one hand, or on the other of devising better methods of protection. Many accidents occur, of course, because no safety measures whatever are adopted, but it is extremely disturbing to find that even when all orthodox steps are taken to effect safety, yet still loopholes exist for unsuspected danger to creep in.

Now for a brief consideration of the three usual methods of protection in use in this country.

Protection by Insulation.

I have long held the view that safety in the domestic field will eventually be reached by complete insulation, or, better still, by the complete elimination of all exterior metal from domestic appliances of all kinds. Development in this direction is, however, very slow, although undoubtedly taking place.

So far we have not got beyond non-metallic accessories, such as switches, lampholders, small switch-fuses, and a limited range of fittings, but even this represents a decided advance in the desired direction of safety. On the Continent, again, particularly in Scandinavia, this development has proceeded further, and has extended to such appliances as radiators, hair-dryers, &c., but these have not yet appeared in this country to any great extent.

However great its desirability, and suitability, for the domestic installation, it is very doubtful if we can look to insulation to solve our danger problems on the farm and in the factory, beyond the provision of safe lighting accessories. Motor-driven farm appliances will apparently always be constructed of metal, for robustness and ease of cleansing, and, owing to the often damp, or wet, situations in which such appliances may be used, it is conceivable that insulated apparatus may have the decided drawback that it can permit current leakage from its surface. All-insulated apparatus will hardly be robust enough for use in the factory, or in other situations where it is likely to receive rough treatment, failing the discovery of some new insulating material. Two instances are given in the 1929 Factory Report of fatalities occurring because of the use of fragile insulated accessories in unsuitable situations, and the use of such apparatus in factories is to be deprecated. Insulation probably represents the only perfect method of protection, but at the moment its application is limited by the amount of completely insulated apparatus available.

That the danger problem will be eventually solved for the home by means of complete insulation is practically certain, but meanwhile we have to devise safety measures applicable to the metal apparatus in use in domestic installations, as well as in the factory and on the farm.

This brings me to the general method of guarding against unwanted potentials on the exterior metal of electrical apparatus, which will be briefly considered.

Protection by Earthing.

This method of protection, in use in this country to a greater extent than in any other, consists of metallically connecting the casings of electrical apparatus to the ground, in such a manner that a difference of potential cannot exist between the casing and the ground. This is an excellent arrangement in theory, but it is now generally agreed that earthing by ordinary means cannot be reliable, and its unreliability considerably discounts its value as a safety measure.

To be effective ordinary earthing methods demand as *essentials*:—

(*a*) An earth connection of extremely low resistance.
(*b*) Absolute continuity of cable sheathings, conduits, main earth connections, &c., not only for small test currents, *but also for heavy fault currents.*
(*c*) The circuit fuse must be correctly adjusted.

Only fairly complicated tests at frequent intervals will ensure that these essentials exist. Any failure of main or other earth connections is not made evident, except by such a test or the occurrence of an accident.

(To be continued.)

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

The F.B.I. on Business Conditions.

The quarterly review of trade conditions and prospects published by the Federation of British Industries, for the fourth quarter of 1930, says that the unexpected collapse of prices of certain staple commodities converted what might have been a somewhat prolonged period of readjustment into an international disaster of the first magnitude. Up to the present, however, British trade, in comparison with other countries, has been only moderately affected. In the United States there had been a fall of 30 or 40 per cent. in the level of production in less than a year. Following upon a study of the leading factors of the present situation the review states.—"The forces responsible for the world collapse in prices appear to have spent themselves, and in this sense we may be said to have touched the bottom of the trough of depression. This does not mean that an immediate recovery is in sight, or that there will not be further falls in individual groups of prices. From now onwards, however, the forces making for recovery should slowly begin to assert themselves. Unfortunately nothing can prevent the coming winter from being a period of difficulty, though next spring should see some improvement."

A German Cable Company and South Africa.

The directors of the Felten and Guilleaume Company contradict the report that the Pretoria Town Council has entered into an agreement with the company for the establishment of a cable factory in the vicinity of Pretoria. The directors add that the company negotiated about two years ago regarding the erection of a cable factory in South Africa without result, so that the plan was abandoned.

A Colour-lighting Demonstration.

Last week the General Electric Co., Ltd., held a special "Showroom Week," during which invitations to view the Magnet House showrooms were sent to large numbers of people connected in various ways with the electrical industry. On Wednesday, October 29th, a special demonstration of the use of coloured lighting was given in the lecture theatre to members of the Display Association and others. After some introductory remarks by Mr. H. W. Roberts, a director of the company, a series of interesting experiments and demonstrations were made by Mr. R. O. Ackerley. He dealt first with the general principles of colour-lighting, with special reference to the media supplied by the company, showing how surfaces of several colours and varying finishes absorbed or reflected light of different colours. One striking demonstration related to the number of lamps of a given wattage required to produce equal intensity on white, red, green and blue surfaces. The white surface was illuminated by a single lamp, but it was necessary to use no fewer than 13 lamps to produce an equal intensity upon the blue surface. The *pièce de resistance* was a model shop window with a made-up centre-piece, which was illuminated in a variety of ways, almost infinite changes being produced by the use of flashers. An expert window dresser then draped a lady in a number of styles, and the effects of changing colour-lighting upon the appearance of the fabrics were seen to great advantage. The audience was thoroughly convinced that there is more in colour lighting than meets the untrained eye.

Electricity and Unemployment.

We are informed that at a luncheon held by the Batti-Wallahs' Society at the Hotel Metropole on Thursday last week Sir John Brooke, the chief guest, delivered a speech on "Electricity and Unemployment." From a copy that has been sent to us we gather that he advocated greater propaganda in order to bring in the potential consumers throughout the country. He reckoned that by such means 50 per cent. more would take supply within the next three years, meaning an additional 2½ million connections, or about six years' work at the present rate. New construction work must have its unremunerative period, but where development would outstrip optimistic prudence the machinery of Government assistance was available and appropriate, and it was particularly available for the most difficult of all electrical problems—rural electrification. Sir John, in summing up, said that we could serve the nation at the moment by increasing as rapidly as possible our capital expenditure by adding to the amount of power at the disposal of the worker and by widening the field of demand which the industry had to supply.

French Electrolytic Copper Production.

A short time ago there was formed in Paris the Société Electro-Cuivre by the Société Métallurgie de Dives and the Société Générale d'Electricité for the purpose of developing the production of copper. The latter company has frequently urged that France should render itself independent of American copper supplies as far as possible. It already possesses a refinery for electrolytic copper at Le Palais in the Haut-Vienne Department, but this cannot be fully utilised on account of the lack of ore or raw copper. Recently, however, the company has become interested in copper ore fields in Bulgaria and also in copper ore mines (Sulitelma and Skellefter) in Sweden. The company is endeavouring to provide itself with resources which will yield at least between 18,000 and 20,000 tons of electrolytic copper per annum, or about 16 per cent. of the total French consumption.

The Australian Duty on Insulators.

At a recent inquiry by the Australian Tariff Board into a request for increased duties on porcelain ware, the Victorian Electricity Commission opposed any increase on insulators intended for voltages over 22,000. It was contended that the demand for insulators for 44,000, 60,000, and 132,000 V was very limited, and in existing circumstances the Commission considered it imperative to obtain its supplies of extra-high-voltage insulators from abroad. The inquiry is not yet concluded.

Liberal Employment Plans.

The Liberal Party has submitted to the Government its plans for dealing with unemployment. These involve a "development loan" of £250,000,000 for expenditure in the first two years of the scheme. It is proposed that the Government should take steps to deal effectively with a number of questions, including the incidence of taxation, Empire development, the co-operation of industry and banking, the extension of export credit guarantees, the revival of the Trade Facilities Acts and the granting of assistance in schemes of rationalisation where this is of urgent necessity. The speeding-up of electrical development is urged, among other schemes, and it is suggested that to secure greater progress in the telephone service it should be handed over to a body having the relative independence of the Central Electricity Board or the British Broadcasting Corporation. By this means, it is claimed, the rate of increase could be improved to 300,000 telephones per annum, as against the present increase of 125,000 per annum.

Germany's Foreign Electrical Trade.

The official returns lately to hand show that the imports of electrical machinery and apparatus into Germany during the eight months ended with August last attained a value of £1,368,100, as compared with £1,692,950 in the corresponding period of 1929. On the other hand, the exports of similar material from Germany during this period increased from £18,362,050 to £18,644,450.

The Siamese Market for Domestic Appliances.

A confidential report on the market for domestic electrical appliances in Siam has been prepared by the Department of Overseas Trade from information furnished by the British Consul-General at Bangkok and it has been issued to firms whose names are entered on the Special Register. United Kingdom firms desirous of receiving a copy of this report should communicate with the Department, 35, Old Queen Street, S.W.1. Reference number A.X. 10444 should be quoted.

Unemployment.

There was an increase of 10,616 in the number of registered unemployed during the week ended October 20th. At that date the total was 2,199,288, as compared with 2,188,672 on October 13th, and 1,214,494 on October 21st, 1929.

The Expansion of Chinese Trade.

The *British Chamber of Commerce Journal*, Shanghai, shows that in 1929 China's imports were valued at 1,265,779,000 Haikwan taels, as compared with 1,195,969,000 taels in 1928, an increase of 6 per cent. Great Britain's share rose from 113,125,000 taels to 118,657,000 taels, or by about 5 per cent. Imports from British India, Canada, Australia, and New Zealand showed substantial advances.

The London-Liverpool Telephone Cable.

The accompanying illustration shows the operation of pulling in the London terminal section of the new London-Liverpool trunk telephone cable, outside the Carter Lane, E.C.,

The London End of the Liverpool Telephone Trunk.

telephone exchange. The photograph was taken by flashlight on the night of October 20th. Standard Telephones and Cables, Ltd., are manufacturing and installing the new cable.

Copper Producers' Conference.

The New York correspondent of *The Times* recently reported that the leading producers of copper in the world had arranged to meet in New York this week for the purpose of reaching an agreement, if possible, to control production in the interest of stabilising the price of the metal. Messrs. Fernand Pisart and Camille Gutt, officers of the Belgian Union Minière du Haut Katanga, had already arrived, and it was understood that Canadian producers would be represented by officers of the International Nickel Company of Canada and Noranda Mines. Belgian acceptance of an agreement had been made conditional on acceptance by all other important producers of copper, including Canadian interests, the latter having hitherto stood aloof from Copper Exporters, Incorporated, the American export combination. It was reported that the Rhodesian group of copper mines was prepared to co-operate with other producers in controlling output.

Electrical Engineering Activity.

The B.E.A.M.A. Index of Activity, quoted by the *Board of Trade Journal*, gives a figure of 108.3 for September (1924=100), as compared with 114.6 for August and 104.1 for September, 1929.

The 1929 Companies Report.

The report for 1929 of the Comptroller of the Companies Department of the Board of Trade shows that 8,672 companies were registered in England during the year, while 7,447 went into liquidation or were removed from the register for other reasons, making the net increase for the year 1,225. The total nominal capital of the companies registered was £229,574,443, the highest since 1920 when the figure was £559,299,697. In Scotland 427 companies with an aggregate nominal capital of £10,848,197 were registered in 1929. As in previous years, the largest class of companies were those having a capital of between £1,000 and 5,000, but 44 English and two Scottish companies were registered with a capital of over a million sterling.

A Malayan Installation.

The new district offices of the Federated Malay States Railway at Kuala Lumpur are wired throughout with c.t.s. 2,500-megohm grade cable, and have some 500 points. Bakelite "Landor" quick-make-and-break switches are used throughout, and also upwards of 150 specially-designed G.E.C. fittings. In addition there are considerably over 100 new type "Everest" G.E.C. 60-in. sweep fans designed for running on a 230-V 50-cycle circuit. The fans are white enamelled with aluminium blades and regulators, and have been specially designed for the Malayan market in view of the fact that it is essential for fans to be run at extremely low speeds. There are over 200 lighting points throughout the building, and "Osram" lamps of various wattages are employed throughout.

Depression in America.

A very depressing view of the situation in the United States was expressed recently by Mr. Virgil Jordan, an American economist, in an address before the National Electrical Manufacturers' Association. He took a number of the leading financiers to task for suggesting that the position could be improved by lowering the standard of living, and said that any movement towards deflation required vigilant control. In his view it was probable that the country was in for an unduly prolonged period of business stagnation and political unrest unless business leadership in every industry mobilised the constructive forces of individual initiative to check the process. Mr. Jordan discounted the prophecies of an early recovery of business. There were no signs of early improvement, and even the expectations of recovery next spring were none too sure unless aggressive effort was brought to bear very soon.

The E.D.A.-E.L.M.A. Campaign.

At a recent meeting of the Guildford Electricity Committee, the borough electrical engineer reported that in connection with the shop-lighting competition which had been arranged by the Guildford Chamber of Trade and the Display Association, the Electrical Development Association had forwarded him a trophy for the best-lighted window and had offered two diplomas for the second and third best-lighted windows. In order to increase the interest and use of electricity for this purpose he recommended that the Committee should give a prize for the second and third best-lighted windows and he suggested that such prizes to the value of £5 and £2 10s., respectively, should be obtained from the Corporation's showroom. The suggestion was adopted.

Leeds shopkeepers have been greatly impressed by the recent E.D.A.-E.L.M.A. Shop Lighting Campaign, and the Chamber of Trade is now preparing a scheme for shop-window lighting throughout the night, if the City Electricity Department can offer a sufficiently low price for off-peak-hour supply.

In a recent issue we referred to the survey of shop-window lighting in Manchester in connection with the Campaign. This covered 826 premises, and it was found that more than half of them were unsatisfactorily lighted, only 10 per cent. being considered good. We have now received a more detailed report of the survey, which also includes Newcastle, South Shields, and York. In the first-mentioned city, 724 shops were inspected; of these only 7 per cent. had adequate illumination, 54 per cent. being classed as unsatisfactory; 19 per cent. used after-hours lighting. In South Shields, of the 432 premises included in the survey, none was considered good and 90 per cent. were unsatisfactory; only 1.5 per cent. employed after-hours illumination. In York, although only two per cent. of the 145 shops examined had good lighting, the proportion of badly-lighted shops was only 49 per cent.; 21 per cent. made use of after-hours lighting.

At a carnival promoted by the Leicestershire and Warwickshire Circle of the British Electrical Development Association, which was held recently at Hinckley, a lorry decorated by the British Thomson-Houston Co., Ltd., attracted considerable attention. The lorry was made to represent "Mazda" lamp cartons, while on a dais stood a lady representing

A "Mazda" Lamp Tableau.

the well-known advertisement "Beauty Enriched by Light." This effective tableau is shown in the accompanying illustration.

A useful handbook has been prepared by the Association (E.D.A. 896) for the use of lecturers in connection with the Campaign. This sets forth an illustrated lecture which can be shortened or altered to suit circumstances. It covers the general principles of electric lighting and leads up to the application of electric lighting to shop windows. A number of simple demonstrations are included and the illustrations take the form of lantern slides showing typical installations, &c., which can be obtained, together with the necessary demonstration equipment, from the Association.

Bankruptcy Proceedings.

G. F. Summers, engineer, lately of 30, Queens Road, Bayswater.—An application was made on October 28th to Mr. Registrar Mellor at the London Bankruptcy Court for an order of discharge on behalf of this bankrupt who failed in September, 1929, with ranking liabilities of £4,620 and assets of £10. The Official Receiver reported that the debtor had been director of various companies. In September, 1928, his wife and another person started as manufacturers of radio receiving sets and equipment under the name of Sumit Electrical Co., at 30, Queens Road, Bayswater. The debtor was the prime mover and obtained money from his father to finance the business which was absorbed by Sumit (London), Ltd., on its formation in March, 1928. The debtor acted as a director of the last-named company until the date of the receiving order. He attributed his insolvency to depreciation in the value of his shareholdings, and to liabilities incurred under guarantees given on behalf of the companies in which he had been interested. The application was opposed by the Victoria Trading Association who claimed to be creditors for £457 in respect of a guarantee given by the debtor to the company in relation to the purchase of radio sets. The Official Receiver charged the debtor with contracting debts provable in bankruptcy without having at the time of contracting them any reasonable or probable ground of expectation of being able to pay them. The discharge was suspended for twelve months.

H. Garde, manufacturer of electrical accessories, 175, Great Portland Street, W.—This bankrupt, who failed in February, 1924, applied last week to Mr. Registrar Warmington at the London Bankruptcy Court for an order of discharge. According to the Official Receiver's report, the applicant began business in 1910. In November, 1921, he patented the "Abco" push-bar switchholder, and entered into a contract with a Birmingham firm for the manufacture of 250 gross of the holders at £7 per gross. Orders were obtained for the holders at £10 per gross, and 165 gross were delivered to and sold by the debtor up to the date of his failure. In January, 1924, he entered into a contract with another Birmingham firm to supply him with 1,000 gross of the holders at £5 per gross, but none was delivered by the time of the failure, and although 70 gross were subsequently delivered, none of the proceeds went to the debtor's estate. He attributed his failure to lack of capital, to liability as surety, heavy interest on borrowed money, and inability to obtain the holders necessary for the execution of orders in hand. His Honour granted a discharge, subject to judgment for £50.

D. C. Brega, wireless and gramophone dealer, 305, Kings Road, Chelsea.—The first meeting of creditors was held on October 28th at London Bankruptcy Buildings, the debtor having filed his petition on October 15th. The Official Receiver reported that the debtor, an Italian, had stated that in February, 1925, he entered into partnership with one A. J. Price and they traded as "Brega's Radio Service." The trading was only a partial success and two years ago Mr. Price retired from the partnership, and the debtor discharged the liabilities of the firm and continued the business alone. The debtor did not admit insolvency and returned liabilities of £540 against assets valued at £779. He attributed his present position to his inability to settle with the creditors because his assets were vested in the hands of a trustee under a deed of assignment. Mr. E. H. Dawkins was appointed trustee of the estate.

R. Pearson, trading as R. Pearson & Sons, Xtra Point Electrical Works, Walshaw Road, Bury, Lancs., electrical accessory manufacturer.—The following are creditors in this recent failure:—

	£		£
Davis & Timmins, Ltd.	498	Birkbys, Ltd.	230
Ebonestos Insulators, Ltd.	220	Hargreaves, J. S. ...	1,900
General Electric Co., Ltd.	200	S. J. Smethurst, Mrs.	643
		Sefton, N.	1,250
		Wilson, Gunn & Ellis	90

P. R. H. W. Baynton, trading as "The Scunthorpe Service and Charging Depôt," 38, Wells Street, Frodingham Road, Scunthorpe, wireless and electrical engineer.—The receiving order herein was made on September 23rd on the debtor's own petition. According to the statement of affairs filed there were ranking liabilities of £324 against assets of £27, leaving a deficiency of £297. The first meeting of creditors was held recently at Great Grimsby, when the case, being a summary one, was left in the hands of the Official Receiver as trustee.

W. V. Owen, electrical engineer, 1, Church Street, Tremadoc.—Receiving order made October 24th on debtor's own petition.

S. J. Sewell & W. L. Brown (Sewell & Brown), electrical and radio engineers, 6A, The Exchange, Muswell Hill, N.—Trustee, Mr. F. Vyvyan, Bankruptcy Buildings, Carey Street, W.C.2, Official Receiver, released October 9th.

W. H. Quintrell, electrical and mechanical engineer, Higher East Street, St. Colomb Major, Cornwall.—First and final dividend of 3s. 7½d. in the £, payable at the Official Receiver's offices, 12, Princes Street, Truro.

K. P. J. Jolivard (K. Jolivard & Co.), electrical engineer, 66, Victoria Street, S.W.—Trustee: Mr. E. Parke, Bankruptcy Buildings, Carey Street, W.C.2, Official Receiver, released October 6th.

I. Turner, wireless dealer, 103a, Little Ilford Lane, Manor Park, E.12.—Last day for receiving proofs for dividend, November 18th. Trustee: Mr. F. Vyvyan, Bankruptcy Buildings, Carey Street, W.C.2, Official Receiver.

D. J. Davies, wireless engineer, 36, Cambrian Street, Aberystwyth.—Last day for receiving proofs for dividend, November 14th. Trustee: Mr. H. W. Thomas, 4, Queen Street, Carmarthen.

E. W. Wood, electrical engineer, 69b, Kettering Road, Northampton.—Last day for receiving proofs for dividend, November 15th. Trustee: Mr. T. Bengough, 6, The Parade, Northampton, Official Receiver.

J. C. K. Birkett, wireless dealer, 1, Scotland Road, Carnforth.—Last day for receiving proofs for dividend, November 14th. Trustee: Mr. H. Parker, 9, Cannon Street, Preston, Official Receiver.

Company Liquidations.

Apex Magneto Co., Ltd., Manchester.—The statutory meeting of the creditors was held recently at the offices of Messrs. Price & Co., 8, Exchange Street, Manchester. The statement of affairs showed liabilities of £408 and net assets of £305, leaving a deficiency of £103. The company was registered in February, 1928. The nominal capital was £1,500 and an existing business was taken over. During the period to August 31st, 1928, there was a gross loss of £100 on sales of £1,012, but during the period ended October 31st of the same year there was a net profit of £150. During the next six months the turnover was £1,316, with a net loss of £197, while up to February 28th, 1930, the net loss was £136 on sales of £1,774. Between March 1st and August 30th of the present year a further net loss of £185 was sustained. A resolution was passed confirming the voluntary liquidation of the company with the liquidator appointed by the shareholders (Mr. A. L. Price). A committee was also appointed consisting of Mr. J. Kershaw, and the representatives of the Manchester Magneto Co., and Messrs. Price & Co. The principal creditors are:—

	£		£
J. Kershaw	77	A. L. Price & Co. ...	48
J. Lucas, Ltd.	50	Fuller Accumulator Co.	29

Hightensite and Ebonite Manufacturing Co., Ltd., Custom House, E.16.—A meeting of creditors was held on October 27th at the offices of Messrs. Mann, Judd, Gordon & Co., Frederick's Place, Old Jewry, E.C., when the liquidator of the company, Mr. Lough, stated that the business had been sold to a new company, and the debenture holder had agreed to accept £10,000 of debentures in the new company in full satisfaction of his claim. The creditors would receive no dividend on their claims, as there was no surplus available for distribution. The receiver for the debenture holders would, of course, pay in full any liabilities which were incurred by him whilst he was carrying on the business. The liquidator and a committee of inspection, which was appointed at the first meeting, had done their utmost to sell the business during the last 18 months. The matter was discussed at some length, but the meeting terminated without any resolution being passed.

South Staffordshire Tramways Co., Ltd.—Winding up voluntarily. Joint liquidators, Mr. C. W. Francis and Mr. T. H. Underhill, 88, Kingsway, W.C.2.

Pharosigns, Ltd.—A general meeting will be held at Melbourne House, Aldwych, W.C.2, on December 2nd, to receive an account of the winding up of the company by the liquidator, Mr. W. G. Kay.

Goring & Streatley Electric Light & Power Co., Ltd.—Particulars of claims by November 17th to the liquidator, Mr. H. Fraser, 4, Fenchurch Avenue, E.C.3.

Deed of Assignment.

J. H. Gath, trading as the Gath Electrical Engineering Co., Halifax.—The following are the principal creditors in this matter:—

	£		£
—. Tasker	219	British Thomson-Houston Co., Ltd.	50
Wholesale Electro (Halifax), Ltd.	181	Philips Lamps, Ltd. ...	42
L. W. Douthwaite and Co.	88	St. Helens Cable and Rubber Co., Ltd. ...	36

"Empire Rationalisation."

This subject was dealt with in an address given before the Business Research and Management Association last week by Mr. H. G. Williams. He defined Empire rationalisation as "Specialisation by agreement between the industries of each part of the Empire," and in the course of his address referred to the Australian market for electrical apparatus. He said that in 1927 Australia imported from foreign countries £2,298,000 of electrical apparatus, from the United Kingdom £4,769,000, and herself produced £2,923,000 worth. There was thus substantial room for expansion by both the British and the Australians at the expense of foreigners.

Book Notices.

"Our World and Us." By Adam Gowans Whyte, B.Sc. (144 pp.). London: C. A. Watts & Co., Ltd. Price 1s. 6d.

net.—This little book deals with the constitution of matter, the atom, the solar and stellar systems and kindred subjects, and although primarily written for children, is simple and lucid without being childish. Mr. Whyte should earn the thanks of many a harassed parent.

The "*Punch* Almanack" for 1931 (price 1s.) is a gay and colourful addition to the "brighter bookstall" movement which sets in at this time of year.

"Alternating-current Electrical Engineering," by W. Tolmé Maccall. Second edition. Pp. viii+496; illustrated. London: University Tutorial Press. Price 15s.

"Testing Radio Sets," by J. H. Reyner. Pp. vi+178; figs. 88. London: Chapman & Hall. Price 10s. 6d. net.

"Rural Electrification," by A. and V. Ekstrom. Pp. 103; figs. 19. Published by the authors. Obtainable from the Electrical Review, Ltd., 4, Ludgate Hill, E.C.4, price 3s. 6d. net.

"Science Abstracts" (A. & B.), Vol. XXXIII, No. 394. London: E. & F. N. Spon, Ltd. Price 3s. 6d. each section.

Dominion Water Power and Hydrometric Bureau of the Department of the Interior, Canada; Water Resources Paper No. 62.—This contains the results of investigations made by the Dominion hydrometric survey during the climatic year October 1st, 1927, to September 30th, 1928, in the provinces of Alberta, Manitoba, Saskatchewan and Western Ontario.

Trade Announcements.

Kenneth Lovell, Ltd., electrical and radio engineers, have opened a new store in Market Street, Huddersfield.

Mr. W. T. Parker, electrical engineer, Burton-on-Trent, has opened a branch establishment at Carter Street, Uttoxeter, where an electricity scheme has just been inaugurated.

Jackson Boilers, Ltd., has removed to new and larger premises—Vulcan Works, Shafton Lane, Holbeck, Leeds. (Telephone: Leeds 22456.)

Gee Jay Supplies (Wholesale), Ltd., 18, High Street, Holywell, Flints., has been appointed sole agent for "Morco" glassware in North Wales, and wholesale distributor of "M.E.M." ironclad switch- and fuse-gear.

With rgard to a note which appeared in this section in our last issue, the Alpha Electrical Apparatus Co., Percy Road, Greet, Birmingham, writes to inform us of its proper title. In our note it was given as "The Alpha Appliance Co., Ltd."

Recent Contract.

The Ford Motor Co., Ltd., has placed an order with Messrs. Crompton Parkinson, Ltd., for 1,460 "Klosd" a.c. motors. This order is believed to be the largest ever placed for standard motors of one type, and has been obtained in competition with all electric motor makers in this country. The motors will be delivered from the regular production schedule of the Guiseley factory.

Social Events.

The Western Electric Co., Ltd., squash rackets team met the Foster Engineering Co., Ltd., at the latter's court at Wimbledon, in a four-a-side match on October 29th. An enjoyable game took place, and the Foster Engineering Co. won by 12 games to 4. The secretaries will be pleased to hear of any other companies running squash racquets teams who would like matches.

The second annual swimming gala organised by the Athletic and Social Club of Standard Telephones and Cables, Ltd., was held on October 30th at the Holborn Baths. The occasion provided a series of keenly contested competitions, and the spectators, who numbered over 500, enjoyed an evening of much interest, together with humour and many thrills. At the conclusion of the meeting, the prizes were presented by the managing director, Mr. E. S. Byng, who congratulated the competitors on their splendid performances, and paid tribute to the work of all those who helped to make the evening so successful, especially thanking Mr. N. R. Garrow (S.C.A.S.A.) who had acted as M.C. and starter. Among those present at the meeting was Mr. P. K. Condict, the executive vice-president of the International Standard Electric Corporation.

The first dance of the season held under the auspices of the G.E.C. Social and Athletic Club took place in the Lecture Hall, "Magnet House," Kingsway, recently. It was arranged by the Table-tennis Section of the Club, Mr. C. A. White being the organiser.

New Catalogues and Lists.

The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Catalogues F(2) and F(3), dealing respectively with electric lighting fittings, accessories and glassware for electric lighting; also a descriptive leaflet (S.L.5501) of the G.E.C. radial lever type metallic dimmers.

The Electrical Equipment & Carbon Co., Ltd., 107/111, New Oxford Street, London, W.C.1.—Price lists R.P.1 and R.P.2, giving particulars respectively of a combined rear lamp and stop light and replacement cartridges for Z fuses.

S. Schneider, 3, Hanover Court, Moor Lane, London, E.C.2.—A leaflet illustrating the "S.T.C." and "Ess" electric irons, two-bar and bowl fires, hair dryers, immersion heaters, &c.

The British Electric Transformer Co., Ltd., Wellington House, Strand, London, W.C.2.—A new "Sunray Tricity" electric fire and radiator catalogue (No. 43, section 3) including details of several new models; also a leaflet relating to the "Tricity" combination cookers Nos. 772 and 773.

The Marconiphone Co., Ltd., 210-212, Tottenham Court Road, London, W.1.—A striking poster drawing attention to the use of Marconi wireless valves on board liners.

The Gear Grinding Co., Ltd., Handsworth, Birmingham.—An excellently-produced publication dealing with gear tooth grinding work for electric railway traction gears, motor car gear boxes, and all industrial purposes.

A. Hinderlich, 2, Bridge Road, Willesden, London, N.W.10.—Price lists of tubular lug and wrought copper cable sockets.

Philips Lamps, Ltd., 145, Charing Cross Road, London, W.C.2.—Two specimen mailing pieces, together with particulars of a scheme for selling Philip's all-mains radio receivers by direct mail.

Equipment and Engineering Co., Ltd., 2 and 3, Norfolk Street, Strand, W.C.2.—A leaflet describing an improved rail grinder and the "Marvel" automatic rail plane.

The Tudor Accumulator Co., Ltd., 50, Grosvenor Gardens, Westminster, S.W.1.—List No. 36, describing the application of "Tudor" accumulators to marine purposes.

Alan Wright, 117, Victoria Street, London, S.W.1.—A booklet giving details of the 1930-1 models of "Inventum" electric fires.

The Wandsworth Electrical Manufacturing Co., Ltd., Kenyon Street, Birmingham.—A pocket price list of "Wandsworth" switches, plugs, sockets, ceiling roses, fuseboards, &c. Particulars are also given of new types of foot-press heater switches.

F. C. Blackwell & Co., Ltd., Great Crosby Works, Liverpool.—The October price list of "Blaco" all-steel conduit fittings.

The Government and Unemployment.

The resumed debate upon the Conservative amendment to the Address in reply to the King's Speech on Monday last centred about the unemployment problem. Mr. Lloyd George put forward the Liberal Party's proposals, which Mr. Morrison (Minister of Transport) said were accepted by the Government in principle. Mr. Morrison doubted the technical feasibility of the schemes, however, and said that the Government was advised that the employment provided by each million pounds of expenditure would be for 4,000 and not 5,000 men as claimed. He said that the Government had already made Treasury grants totalling £50,000,000 towards the interest on capital expended by electricity and transport concerns. He particularly mentioned the £12,000,000 scheme of the Underground and Metropolitan Railways, and schemes put forward by the Electricity Commissioners involving the expenditure of £12,500,000 including the standardisation of frequency on the North-East Coast. He claimed that by the end of the year between 200,000 and 250,000 men would be employed as a result of schemes approved by the Government.

A Radio Patent Announcement.

The *Wireless and Gramophone Trader* reports that the merging of the radio receiver patents owned or controlled in this country by the Gramophone Co., Ltd. (His Master's Voice), Marconi's Wireless Telegraph Co., Ltd., and Standard Telephones & Cables, Ltd., has just reached its final stages, and joint licences by the three companies will now be granted to approved British manufacturers. All present holders of the usual "A3" licence will now be able to obtain the benefit of patents owned or controlled by Standard Telephones & Cables, Ltd., without any increase in the rates of royalty.

A Time-Switch Inquiry.

A British manufacturing firm has an order to place for a large installation of time switches, the full specification being as follows:—"11 oil-break lever-movement electrically-wound triple-pole time switches, 125 amp., 400 volt nominal capacity, with dials arranged for two 'on' and 'off' movements in 24 hours, complete with week-end cut-out and arranged for remote push-button control. In addition, the time switches should be arranged for positive local manual control as these switches will be used in place of manually-operated oil switches. We shall also require one triple-pole time switch to the above specification of 40 amp. 400 volts nominal capacity."

Our correspondents assure us that they have made every endeavour to get in touch with a British manufacturer of this apparatus, but so far without success, except for one isolated case where the price of the apparatus is nearly double that of foreign switches. They ask us to give the matter publicity so that our advertisers and others may benefit from it.

Prices of Materials.

Messrs. Edward Till & Co. report, November 4th: India-rubber, Para fine: 5¼d., ¼d. inc.

Messrs. James & Shakespeare report, November 4th: Copper bars (best selected), sheet and rod: no change.

Messrs. F. Smith & Co. report, November 4th: Copper (electrolytic) bars: £46 5s., £2 15s. dec.; ditto ditto sheets, no change; ditto ditto wire rods: £56 5s., £2 15s. dec.; ditto ditto h.c. wire: 7-7/16d., 3/16d. dec. Silicium bronze wire, 9¼d., ¼d. dec.

Messrs. James Forster & Co., in their letter dated November 1st, stated that the lead market had a slightly firmer tone last week, attributable more to sympathy with the better tone in other metals—particularly spelter—than to any improvement in the general situation of lead itself. Consuming demand still remains very moderate, and with ample supplies arriving, there seems no tangible reason for an advance in prices unless the market receives support. There are no signs yet of any curtailment of output.

Lighting and Power Notes.

Bishops Stortford.—LIGHTING OF INSTITUTION.—The Herts County Council Public Assistance Committee is considering the question of installing electric lighting throughout the institution.

Blackpool.—AUTUMN ILLUMINATIONS.—The value of autumn illuminations to Blackpool was mentioned at a recent meeting of the Town Council. Councillor Whittaker, chairman of the Electricity Committee, said that the electricity consumed during the month of the illuminations created a record, and also that about 6,617,167 passengers travelled on the tramways. The receipts were £50,000, as against £19,000 before the illuminations.

Brighton.—CHANGE-OVER.—The Town Clerk has been instructed to make formal application to the Electricity Commissioners for powers to change over the system of supply from d.c. to a.c. throughout the whole undertaking as and when opportunity occurs.

Canterbury.—YEAR'S WORKING.—The Corporation electricity undertaking showed a gross profit for the year ended March 31st last of £18,846, an increase of £1,526 over the preceding year. After loan and other charges had been deducted, there was a net profit of £7,744, as compared with £7,901 in 1928-29.

Carlisle.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend mains at an estimated cost of £1,344.

China.—NEW POWER STATION.—For the development of manufacturing enterprises in Kiangsu, the industrial centre of Wusih was selected some time ago by the National Reconstruction Commission as the most suitable place for the establishment of a large generating station. The *Chinese Economic Bulletin* states that surveys have now been completed and the site of the works decided upon. Construction is expected to be started within the current year. Arrangements are also to be made for the establishment of similar power plant on the eastern shore of the Hung-tse Lake in northern Kiangsu.

Continental.—SWEDEN.—It is stated that a large industrial combine is considering plans for the construction of a large new power station at the Selsforsen Rapids, about 25 km. from the mouth of the Skellefte River and 10 km. from the Kraangforsen Rapids. The Kraangforsen together with the Finnforsen Rapids on the same river are already exploited by large power stations owned by the town of Skellefteaa which are supplying power to the mining company Skellefteaa Gruvaktiebolag and other concerns. The fall of the Selsforsen Rapids is 20.7 m., and it is estimated that with a normal water level 30,200 h.p. could be generated. Next year the Lanforsen station will be enlarged by another set of 13,000 h.p. and the Maansbo station by about 8,600 h.p. Among other new constructions are one on the Dal River, opposite the above-mentioned Maansbo plant, to produce 7,500 h.p., which is being built by Avesta Jaernverks Aktiebolag and will probably be completed in 1932, and the Munkforsen plants on the Klarelven River, constructed by Uddeholms Aktiebolag to produce 30,000 h.p. The Waterfall Board has begun preparatory work for a station at Vargoen, north of Trollhätten, another station on a tributary of the Indal River at Sillre, and a third at Malfors on the Motala River, the last-named to be used for the electrification of the Stockholm-Malmö railway line.—*Reuter's Trade Service* (Stockholm).

FRANCE.—The Société des Forces Motrices de la Vienne, of Paris, has recently secured a concession to establish a hydro-electric station to utilise the power of certain falls on the River Thaurion in the Departments of Creuse and Haute Vienne. It is estimated that 17,200 kW is available.

ITALY.—The output of the electric power stations in Italy during the eight months ended August last amounted to 6,526,097,000 kWh, as compared with 6,257,809,000 kWh in the corresponding period of 1929, an increase of 4.29 per cent.

BELGIUM.—The large new power station constructed at Schelle by the Société d'Electricité Interescaut was recently officially opened. Erected on the banks of the River Scheldt, the plant will supply power through the greater part of Belgium, it being linked up with the power stations at Zeebrugge, Mons, Liège, and other places. When finally completed the station will have a capacity of 680,000 kW.

RUSSIA.—According to the preliminary returns of the Supreme Economic Council of the U.S.S.R., forty large regional power stations were under construction during the year, the value of the work carried out for the year amounting to 450 million roubles. These stations include the Dnieprostroi, Chelyabinsk, Stalingrad, Rion, and a large number of big thermo-electric stations. A number of large factories are also being pushed forward, including the Magnitogorsk metallurgical works.

Dover.—SUPPLY TO WHITFIELD.—The Corporation Electricity Committee recommends that application be made for sanction to a loan of £4,000 for the purpose of giving a supply of electricity to Whitfield. In connection with this proposed extension the borough electrical engineer states that owing to the increased load anticipated during the next two years, some arrangements should be made soon for obtaining electricity from an outside source.

Earby.—UNEMPLOYMENT SCHEME.—A scheme for the expenditure of £3,841 on the extension of the Urban District Council's electricity undertaking has been approved by the Unemployment Grants Committee for the purposes of a grant.

Eastbourne.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to a loan of £18,150 for switchgear and transforming plant at the electricity works.

East Ham.—CABLE EXTENSIONS.—The Corporation Electricity Committee has approved an estimate of £5,494 for laying a new h.p. feeder cable from the generating station to the Charlemont Road housing site and the Isolation Hospital. Application has also been made for sanction to the borrowing of £2,002 for the extension of distributor cables in various streets.

French Congo.—HYDRO-ELECTRIC DEVELOPMENT.—A concession has recently been granted to the Société Hydro-Electrique du Congo Française to establish a hydro-electric station at Djoue, with a capacity of about 38,000 kW, to utilise the power of the river of the same name. The power generated is to be transmitted at 14,000 V to the Congo River port of M'Pila.

Glasgow.—PROGRESS DURING SEPTEMBER.—Under the Corporation Electricity Department's scheme 797 houses were wired in September, making a total of 25,947, while hire appliances installed numbered 120, making a total of 20,009.

MAINS EXTENSIONS.—The Corporation Electricity Committee has agreed to extensions of distributing mains estimated to cost £1,786.

Glemsford and Bures.—INAUGURATION OF SUPPLY.—An electricity supply was inaugurated on October 24th at Glemsford and Bures, Suffolk, in the presence of Mr. B. G. Drummond, general manager of the East Anglian Electric Supply Co., Ltd. These villages are in the rural area covered by the company's Order of 1926; the work on the few remaining villages is well in hand.

Guildford.—WATER-HEATING TARIFF.—The Corporation Electricity Committee has adopted an off-peak tariff for water heating.

Hoylake.—LOAN.—An application is being made by the Urban District Council for sanction to the borrowing of £10,000 for mains and services.

Ilford.—LOAN.—The Corporation Electricity Committee is applying for sanction to the borrowing of £50,000 for mains and services.

Irlam.—ELECTRICITY SCHEME.—The Urban District Council has entered into an agreement with the Stretford and District Electricity Board, whereby the Board will bear the whole of the capital cost of the electricity scheme. Irlam and Cadishead consumers will be charged a trifle more for electricity for two years.

Isle of Man.—INSPECTION OF MAINLAND ELECTRICITY UNDERTAKINGS.—Representatives of a Consultative Committee appointed by the Isle of Man House of Keys has been making a tour of inspection of some of the mainland electricity undertakings with a view to preparing a report to enable the House of Keys to come to a decision with regard to the Isle of Man Electric Light and Power Bill. A few days ago the Committee was shown over the works of the Mid-Cheshire Electricity Supply Company, and after returning to Manchester, travelled to Aylesbury.

Lancaster.—LOAN.—Application is to be made by the Town Council for sanction to a loan of £1,342, additional expenditure on generating plant at Caton Road station.

CORPORATION TO SUPPLY CATON.—An agreement has been reached by the Electricity Department with the Caton Electric Supply Company whereby the Electricity Committee will take over the supply in Caton and district. The company will continue to supply individual premises until the Lancaster Corporation supply is available or until September 30th, 1931, whichever date is the earlier.

London.—SHOREDITCH.—A failure of the electricity supply occurred in practically the whole of the Borough Council's area last Friday just before 5 p.m. and continued for over an hour. A breakdown at the Dalston Lane sub-station is stated to have been the cause of the failure.

Loughborough. — EXTENSION SCHEME. — The Corporation General Purposes Committee has recommended a scheme (which it had rejected on a previous occasion) for the inclusion in the Corporation's area of supply of the parishes of Cotes, Hoton, Prestwold, Wymeswold, Burton-on-the-Wolds, and Walton-on-the-Wolds.

Manchester.—EXTENSIONS.—The Corporation Electricity Committee is applying for sanction under the Development (Loan Guarantees and Grants) Act, 1929, for a grant to pro-

vide an electricity supply to certain houses in Moss Nook, Northen Etchells, at a cost of £4,820.

Plymouth.—LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to the borrowing of £47,990 for the provision of new sub-stations, mains, and plant. Cable extensions in nineteen streets in Plymouth and Devonport are to be carried out.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

SOUTHEND-ON-SEA.—Special flat rate for lighting and power: From 3.85d. to 3.5d. per kWh.

SALFORD.—Alternative kilowatt demand rates for power users whose maximum demand is 25 kW or over: From ¼d. per kWh for all energy consumed to ¼d. per kWh for the first 250,000 kWh per quarter, 0.27d. for the next 250,000 kWh, and 0.25d. for all energy in excess of 500,000 kWh per quarter; no change will be made in the charges per kW of maximum demand or the discounts and advances for power factor where the supply is a.c.

TYNEMOUTH.—Lighting flat rate: From 4¾d. to 4½d. per kWh. Prepayment meter lighting: From 5d. to 4¾d. per kWh. Maximum demand system: To 7d. per kWh for 150 hours' demand in winter and 90 hours' (at present 100 hours') demand in summer and thereafter 1d. per kWh. Domestic two-part tariff: "Unit" charge reduced to 0.6d. (present charge 0.75d.) in summer and 0.75d. in winter. Power: First 100 kWh per quarter, 3d. per kWh (present charge 3½d.), next 400 kWh (instead of 500 kWh), 2d., and remainder at 1½d. per kWh (same). Reductions have also been made in the "cut-off," factory, and shopkeepers' tariffs.

HORSHAM.—Domestic lighting: From 6d. to 5½d. per kWh.

Reigate.—LOANS.—The Town Council has applied for sanction to loans of £5,000 for ordinary mains and services, and £715 for excess expenditure in connection with the extension of h.p. and l.p. mains.

BULK SUPPLY AGREEMENT SEALED.—An agreement with the London and Home Counties Joint Electricity Authority for a bulk supply has been sealed.

Shipley.—CHANGE-OVER.—The Urban District Council Electricity Committee has authorised the engineer to make arrangements for a change-over from d.c. to a.c. supply between Kirkgate and Otley Road.

Southend-on-Sea.—CHANGE-OVER.—The borough electrical engineer is arranging for the change-over in the area between Hamlet Court Road and Woodfield Road Bridge, and certain h.p. cables in that area are to be taken up and relaid.

PREPARATIONS FOR GRID SUPPLY.—Before a supply of electricity can be taken from the Central Electricity Board it will be necessary for certain works to be carried out, and it is suggested that the two 750-kW Diesel engines at the Leigh substation should be removed to the London Road generating station, and that a 750-kW rotary convertor now at Thorpe Bay be transferred to Leigh and replaced by a new 250-kW convertor.

Special Orders.—Application has been made to the Electricity Commissioners for Special Orders authorising (*a*) The Oswestry Corporation to extend its area of supply so as to include the parishes of Kinnerley, Knockin, Llanblodwel, Llanymynech, Ruyton of the Eleven Towns, Sychten, and West Felton, and parts of the parishes of Selattyn, Oswestry Rural, and Whittington; and (*b*) the South-East Kent Electric Power Co., Ltd., to supply electricity in the parishes of Stonar, St. Lawrence Extra, Minster, Acol, Monkton, Sarre and St. Nicholas-at-Wade in the Isle of Thanet rural district.

Sutton Coldfield.—YEAR'S WORKING.—We have received from Mr. Thomas Bloore, electrical engineer and manager of the Corporation Electricity Department, a copy of his annual report, together with the statement of accounts of the undertaking for the year ended March 31st last. The total revenue showed an increase from £35,594 to £37,520, while the working expenditure amounted to £22,950, as compared with £18,598 in the preceding year. There was a gross profit of £14,571 (£16,995) and, after providing for capital expenditure (including £1,661 for new meters), there remained a net profit of £3,038, as against £5,961 in 1928-29. The capital expenditure during the year amounted to £26,023 and included £15,996 for mains; the total capital expenditure to the end of the year was £188,717. The electrical energy sold increased from 2,552,196 to 2,961,757 kWh but the maximum supply demanded fell from 1,971 to 1,841 kW.

Torquay.—BULK SUPPLY.—The Corporation Electricity Committee has received a letter from the Urban Electric Supply Co., Ltd., agreeing to take a bulk supply of electricity for distribution in the borough of Dartmouth.

United States.—ELECTRICAL DEVELOPMENT.—According to *Power*, a preliminary permit for a 136,000-h.p. power scheme on the Colorado River has been asked of the Federal Power Commission by the Metropolitan Water District of Southern California, Los Angeles. Power would be employed for pumping water through a projected aqueduct from the Colorado River to the southern California coastal plain to be used for domestic and municipal purposes. The contemplated development would include a diversion dam a mile and a half below the mouth of Bill Williams River, a tunnel, and power house with an installed capacity of 136,000 h.p.

Wallasey.—LOAN.—The Corporation Electricity Committee recommends that sanction be obtained to a loan of £30,000 for mains and services.

Warrington.—OVERHEAD LINES.—The Corporation Electricity Committee is applying for sanction to the borrowing of £2,520 for overhead lines from Appleton Thorn to the boundary of High Legh, with branch lines to the boundaries of Grappenhall, Lymm, and Antrobus.

Wrexham.—NEW ELECTRICITY TARIFFS.—The Town Council has adopted the following new scale of charges:—Heating and cooking: 1¼d. per kWh for the first 100 kWh per quarter, and 1d. per kWh beyond. Heating of large buildings (schools, churches, halls, and kinemas): first 100 kWh per quarter 1¼d. per kWh, beyond ¾d. per kWh, less 5 per cent. discount for prompt payment of accounts.

SUPPLY TO HOUSING ESTATE.—The Town Council has decided to supply electricity to 173 houses being erected at Maesydre.

Tramway and Railway Notes.

Argentina.—BUENOS AIRES.—Passengers numbering 183,000 were carried on the first day of working of the new Lacroze tube railway in Buenos Aires. On the second day the number increased to 196,000.

Australia.—SYDNEY.—According to the *Sydney Daily Guardian*, official figures placed before the Transport Trust show that a deficit of £600,000 on the tramways is practically inevitable this year. Immediate and far-reaching economies have become imperative and an appeal is to be made to the employés to make sacrifices to avert a perilous position. Mr. Maddocks, commissioner of road transport, has directed the Tramway Management Board to take immediate action, but the proposed economies will not cover more than half the deficit.

Continental. — SPAIN. — The electric railway between Barcelona and Puigcerdá will shortly be converted to a narrower gauge (1.44 m.) corresponding to that of the French system, thus enabling loads to be carried between the docks and any point in Europe without transfer. The company maintaining the line between Barcelona and Port Bou also proposes to convert the gauge, or add a third rail.—*Reuter's Trade Service* (Barcelona).

ITALY.—Details have recently been received concerning the construction of the small electric railway from Arezzo to Sinalunga. The railway is only 40 km. in length but it is stated to be the most up-to-date of its kind in Italy. It runs through the agricultural district known as the Val da Chiana in Tuscany, close to the Apennines, and the time taken for the complete journey including stops is 45 minutes. The d.c. overhead system of electrification at 3,000 V has been chosen and each locomotive is provided with four motors of 150 b.h.p. (with an overload capacity of 100 per cent.) coupled permanently in pairs, each operating at a maximum pressure of 1,500 V. The steepest incline on the route is 13.8 per 1,000 and the gearing of the locomotives has been designed to draw passenger trains at a speed of 75 km. per hour and goods trains with a weight of 200 tons.

SWITZERLAND.—The operating pressure on the Seetal electric railway is being raised from 5,500 to 15,000 V.

FRANCE.—At a meeting of the Union Internationale des Transports en Commun, held recently in Paris, a good deal of attention was devoted to the system of power recuperation on electric tramways during braking and when running down hill, which has been developed by the S.T.C.R.P., the company which operates the electric tramway system in the Paris area. The new method is in use on the electric tramway running between Versailles and Saint Cloud, and it is claimed that as much as 30 per cent. of the power used is being recuperated.

Darwen.—YEAR'S WORKING.—It is reported in the Corporation's annual financial statement that the tramways showed a profit of over £5,500, an increase of £1,480 on the previous year's profit.

Glasgow.—PROPOSED RECONSTRUCTION OF TRACK.—The Corporation is considering the position of the tramway track in the widened portion of Great Western Road. The manager of the Transport Department has explained that the unexpired life of the present tramway track is estimated at from eight to ten years, and that the cost of renewing the track at this date, inclusive of new ducts and manholes, excavations and overhead work, is estimated at from £16,000 to £17,000. It was decided to ascertain if the Unemployment Grants Committee would be prepared to make a grant towards the cost of the work.

London.—NEW TRAMCARS.—The Metropolitan Electric Tramways, Ltd., is to purchase 54 new tramcars at a cost of £3,000 each.

Sunderland.—EXPERIMENTAL TRAMCAR.—A single-deck tramcar is being specially built by the Corporation Electricity Department for use on the Villette Road route in competition with the 'bus service.

United States.—OIL-ELECTRIC CARS.—The first of the new oil-electric cars, manufactured by the Westinghouse Company for the Erie Railway, has been put into service. The car is equipped with two Diesel engines driving two Westinghouse generators, and is capable of a maximum speed of 85 miles an hour. It is said to be able to run 1,000 miles without refueling and challenge motor road services in short-distance passenger trips.—*Reuter's Trade Service* (New York).

Wolverhampton.—RAILLESS CARS.—Railless cars were substituted for 'buses on two of the Corporation's services on October 27th.

Telegraph and Telephone Notes.

Argentina.—RADIO-TELEPHONY.—According to the *Review of the River Plate* the Provisional Government has authorised the Union Telefonica to effect a radio-telephonic service between Argentina and Germany in combination with the Compañia Internacional de Radio.

Austria.—THE TELEPHONE SYSTEM.—At the commencement of the present year the Austrian telephone system comprised a total of 18,715 miles of lines and 463,768 miles of conductors, the latter consisting of 78 per cent. of cable, 18 per cent. of bronze wire, and 4 per cent. iron wire.

China.—TRUNK TELEPHONY.—The Chinese North-eastern Political Affairs Committee is reported to have approved an extensive programme for the development of a trunk telephone system in Manchuria at a cost of £800,000.

Overhead Lines.—INDUCTIVE INTERFERENCE.—Representatives of the telegraph administrations in Denmark, Germany, France, Switzerland, Great Britain, Finland, and Czecho-Slovakia, together with delegates of electrical manufacturing firms in Germany, England, and Switzerland, recently paid a visit to Sweden in company with the secretary of the International Telegraph Union in order to ascertain in the region of Skillingary inductive effects between parallel conductors. Measurements of this nature form part of the working programme of the international combination, the Commission Mixte Internationale, with which a large number of European telephone administrations and high-voltage power organisations co-operate, whose object it is to examine by means of experiments in different places the disturbing effects on low-voltage conductors caused by high-voltage installations. The area selected for the experiments in Sweden comprised about 15 square kilometres between Vaggeryd and Skillingaryd.

Philippine Islands.—CONSOLIDATION OF TELEPHONE INTERESTS.—The consolidation of all private telephone interests on the island of Luzon has been achieved by the purchase by the Philippine Long-Distance Telephone Co. of the property (which includes the equipment and lines in Manila and suburbs) of the Philippine Telephone & Telegraph Co. The property purchased represents one of the most modern and complete automatic telephone systems in the Far East. The system has been practically all installed within the past few years, and facilities have been provided for a considerable increase in new business. The Philippine Long-Distance Co. was organised about two years ago to carry on an island-wide telephone service, which will eventually be connected with the telephone systems of other countries, arrangements having been made toward this end during the past several months. It is understood that through the close relationship with the Bell system in the United States, Trans-pacific telephone service may be expected as soon as experiments prove that such a service can be effectively started and maintained with dependability. The Long-Distance Co. has now in operation nearly 440 miles of long-distance telephone circuits on the island of Luzon, and is rapidly extending its lines to all the important municipalities. Radio-telephony tests are now being carried on between Manila, Iloilo, and Cebu, and as soon as these have been proved successful this facility will be opened to the public.

Radio Notes.

Canada.—RESEARCH.—The National Research Council of Canada has established an associate committee on radio research under the chairmanship of Dr. A. S. Eve, of McGill University. It will be similar to the boards functioning in Britain, Australia, and other countries, and will work in close co-operation with the radio division of the Department of Marine. Study of the frequency standard problem will be one of the first to be undertaken, to be followed by investigations into refraction over water, impediments to long-distance transmission, and the effects of both the aurora and meteorological conditions on wave propagation.

Germany.—RADIO INTERFERENCE.—In several European countries steps are being taken to make radio-interference a criminal offence. The police at Cossel, in Germany, have issued regulations stating that all persons using radio apparatus that causes interference will be prosecuted. According to Messrs. Philips Lamps, Ltd., they are also placing restrictions on the sale of sets that have not been made "non-interfering."

United States.—STATION POWER.—The main feature of the Federal Radio Commission's present session is the unanimity of broadcasters' demands for maximum station power of 50 kW. Eight of them are claiming the two remaining 50-kW channels available and there have been complaints at the Commission's limitation of the number of cleared channels available to such stations to 20. The arguments are based upon the facts that large rural areas are inadequately served and the unsatisfactory service of synchronised stations, says *World-Radio*.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—Posts and Telegraphs Department. December 2nd. Cord tags. (A.X. 10332.)*
January 6th. Indicators. (A.X. 10403.)* Submarine cable. (A.X. 10309.)*
January 13th. Terminal strips. (A.X. 10465.)*
February 3rd. Telephone exchange power boards. (A.X. 10466.)*

BRISBANE.—City Electric Light Co., Ltd. December 8th. Four 5,000-kVA single-phase transformers. (A.X. 10393.)*

Dublin.—November 19th. Port and Docks Board. Electrical supplies for 12 months ending December 31st, 1931. Particulars from, and tenders to, Mr. E. H. Bailey, secretary, Port and Docks Office, Westmoreland Street.

Eccles.—November 24th. Electricity Committee. Installation of electric light and power wiring and fittings in new showroom and offices now being erected in Church Street. Specification (deposit £1 1s.) from borough electrical engineer, Electricity Works, Cawdor Street, Patricroft.

Edinburgh.—November 17th. Corporation. Electric lighting installation at Prestonfield School. Specifications, &c., from Mr. W. F. Mitchell, consulting electrical engineer, 34, St. Andrews Square; tenders to town clerk.

London.—CENTRAL ELECTRICITY BOARD.—November 10th. 66,000-V transformers. (October 10th.)
November 24th. 66,000-V and lower voltage transformers. (October 17th.)

H.M. OFFICE OF WORKS.—November 13th. Supply and laying of cables at the National Physical Laboratory. (October 24th.)

INDIA STORE DEPARTMENT.—November 28th. Transmission telephone lines for Uhl River hydro-electric project. (See this issue.)

Manchester.—November 19th. Electricity Department. Fire extinguishing equipment for transformer chambers. (October 31st.)

New Zealand.—WELLINGTON.—Post and Telegraph Department. December 2nd. Automatic dials. (A.X. 10294.)*
December 9th. Telephone transformers. (A.X. 10370.)*
December 10th. Switchboard cable. (A.X. 10371.)*
December 15th. Transmitters. (A.X. 10362.)*

January 19th, 1931. Electric lamps and condensers. (A.X. 10446.)*

Rangiora.—December 3rd. Borough Council. Truck-type switchboard. (A.X. 10372.)*

Public Works Department.—January 27th, 1931. 11,000-V switchgear and metering for Mangahao power scheme (A.X. 10373.)*

Plymouth.—November 21st. Corporation. L.p. oil-immersed switchgear. (October 31st.)

Rochdale.—December 1st. Electricity Department. A.c. single-phase prepayment meters. (October 31st.)

South Africa.—Cape Town.—November 27th. City Electricity Department. Thirteen 3-phase transformers. (A.X. 10322).*

Kingwilliamstown.—December 2nd. Municipal Council. Turbo-alternators, centrifugal pumps and switchgear. (A.X. 10353.)*

Durban.—November 28th. Corporation Electricity Department. Metal-clad switchgear. (A.X. 10456.)*

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Barrow-in-Furness.—Accepted :—
Four 10-kVA, single-phase, 6,600-V transformers.—Metropolitan-Vickers Electrical Co., Ltd.

Bournemouth.—Town Council. Accepted :—
Installation of electric coloured-light traffic control signals (£1,109).—Forest City Electric Co., Ltd.

Cardiff.—Rural District Council. Accepted :—
Sub-station switchgear.—Erskine, Heap & Co., Ltd.

Carlisle.—Housing Committee. Accepted :—
Wiring 94 houses on Botcherby estate.—Wm. Batey and Son.
Wiring 56 houses on Raffles estate.—R. M. Hill & Sons.

East Ham.—Sewage Works Committee. Recommended :
Electrically-driven clinker washer (£188).—Hughes and Lancaster, Ltd.

Glasgow.—Health Committee. Recommended :—
Renewal of electric wiring at Ruchill hospital (£1,673).—Alexander Anderson, Ltd.
Education Committee. Recommended :—
Electric lighting and heating at Wolseley School drill hall (£88).—A. Robertson.
Electric lighting and heating at Knightswood School extension (£112).—D. Henderson.
Libraries Committee. Recommended :—
Four electric motors for driving book-binding machines (£81).—Metropolitan-Vickers Electrical Co., Ltd.
Electricity Committee. Recommended :—
Air-heating and conditioning plant at Waterloo Street premises (£4,617).—James Coombe & Son, Ltd.

Ilford.—Electricity Committee. Accepted :—
Lift at new offices (£289).—Titan Lift Co., Ltd.

Irlam.—Urban District Council. Accepted :—
Supplying and laying cables in Liverpool Road (£15,632).—W. T. Glover & Co., Ltd.
Installation of electric light at 140 houses (£1,008).—H. E. Harrison.

Lancaster.—Electricity Committee. Accepted :—
Cables.—Derby Cables, Ltd.
Transformers.—Ferranti, Ltd.

Liverpool.—Public Assistance Committee. Accepted :—
Installation of an automatic internal telephone system at Walton Hospital.—Standard Telephones & Cables, Ltd.

London.—London County Council.—Education Committee. Accepted :—
Electrical installation at Westminster Technical Institute (£2,358).—Leonard G. Tate & Co., Ltd.

Manchester.—Education Committee. Accepted :—
Electrical installation at the Briscoe Lane municipal school.—Brookes & Co. (1929), Ltd.

Oldham.—Education Committee. Accepted :—
Electric lighting installation at Waterloo Gymnasium.—W. Caton & Sons.
Electricity Committee. Accepted :—
Cable.—Union Cable Co., Ltd.

Radcliffe.—Urban District Council. Accepted :—
Sub-station switchgear.—Erskine, Heap & Co., Ltd.

Salford.—Electricity Committee. Accepted :—
Pilot cable, &c., in connection with 33,000-V feeder between Frederick Road station and Trafford sub-station (£427).—W. T. Glover & Co., Ltd.
E.h.p. metal-clad switchgear (£156).—English Electric Co., Ltd.
300-Ah battery (£474).—Chloride Electrical Storage Co., Ltd.
Housing Committee. Recommended :—
Wiring 36 houses at Gerald Road (£370).—F. Bainbridge.

Seaham Harbour.—Electricity Committee. Recommended :—
A.c. test bench and test meter (£100).—Edison Swan Electric Co., Ltd.

Torquay.—Health Committee. Accepted :—
Renewing batteries at destructor (£192).—Chloride Electrical Storage Co., Ltd.

Warrington.—Housing Committee. Accepted :—
Wiring 174 houses at Westy Lane.—H. L. L. Petts.

Forthcoming Events.

North-East Coast Institution of Engineers and Shipbuilders.—Friday, November 7th. Mining Institute, Newcastle-on-Tyne. 6 p.m. "Feed Water Systems for Steam Installations." Mr. R. W. Allen.

Institution of Electrical Engineers.—Monday, November 10th. Institution, London, W.C. 7 p.m. Informal meeting. Discussion on "V.i.r. Cables: their Failures, their Future, and their Rivals." Opened by Mr. A. F. Stevenson.

(London Students' Section.)—Saturday, November 8th. 2.30 p.m. Visit to Holborn Telephone Exchange. Friday, November 14th. Institution, London. 6.15 p.m. "The Economic Applications of Electricity to Space Heating." Mr. T. I. Illingworth.

(North-Eastern Centre).—Monday, November 10th. Armstrong College, Newcastle-on-Tyne. 7 p.m. "The Cooling of Electrical Machines." Mr. D. B. Hoseason.

Students' Section.—Friday, November 7th. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. "The Design of High-tension Sub-stations." Mr. E. N. Cunliffe.

(North-Western Centre).—Tuesday, November 11th. Engineers' Club, Manchester. 7 p.m. "The Cooling of Electrical Machines." Mr. D. B. Hoseason.

(North Midland Centre.)—Tuesday, November 11th. Hotel Metropole, Leeds. 7 p.m. "The Medical and Surgical Applications of Electricity." Mr. B. Leggett.

(Hampshire Sub-Centre).—Wednesday, November 12th. Municipal College, Portsmouth. 7.30 p.m. "Oil-filled Cables." Mr. R. E. Horley.

(Dundee Sub-Centre).—Thursday, November 13th. University College, Dundee. 7.30 p.m. "Automatic Railway Control." Mr. D. B. McKenzie.

Institute of Marine Engineers.—Tuesday, November 11th. Institute, 85, The Minories, E.C.3. 6 p.m. "Tubes for High-pressure Water-tube Boilers." Eng. Lt.-Commander S. F. Dorey.

Electrical Power Engineers' Association (London Local Group).—Tuesday, November 11th. Junior Institution of Engineers, 39, Victoria Street, S.W. "Mains Testing and Fault Finding." Mr. J. T. Corbin.

Institution of Engineering Inspection.—Wednesday, November 12th. Royal Society of Arts, John Street, Adelphi, W.C. 5.30 p.m. "Some Legal Clauses and Consequences of Engineering Contracts." Mr. C. L. Nordon.

Institute of Fuel.—Wednesday, November 12th. Chemical Society, Burlington House, Piccadilly, W. 6 p.m. "Graphical Methods of Fuel Control." Mr. J. Cunningham.

Electroplaters' and Depositors' Technical Society.—Wednesday, November 12th. Northampton Polytechnic Institute, St. John Street, Clerkenwell, E.C. 8.15 p.m. Presidential address. Dr. R. S. Hutton.

Edinburgh Electrical Society.—Wednesday, November 12th. Society, 16, Royal Terrace, Edinburgh. "The Scottish Grid." Mr. A. E. McColl.

Batti-Wallahs' Society.—Wednesday, November 12th. Hotel Metropole, London. 12.30 for 1 p.m. Luncheon.

Royal Society of Arts.—Wednesday, November 12th. John Street, Adelphi. 8.30 p.m. "The Royal Society of Arts' Competition of Industrial Designs." Prof. A. E. Richardson.

Electrical Trades Benevolent Institution.—Wednesday, November 12th. Savoy Hotel, London. 7 for 7.30 p.m. Annual Festival.

Optical Society.—Thursday, November 13th. Imperial College of Science, South Kensington, S.W. 7.30 p.m. Demonstrations including "Photo-cell Applications" by the Research Staff of the General Electric Co., Ltd.

Institution of Welding Engineers.—Thursday, November 13th. Institution of Mechanical Engineers, Storey's Gate, St. James's Park, S.W. 7.45 p.m. "Metal Surface Hardening." Mr. A. E. Shorter.

Midland Electrical Engineers' Ball.—Friday, November 14th. Grand Hotel, Birmingham.

Junior Institution of Engineers.—Friday, November 14th. Institution, 39, Victoria Street, S.W. 7.30 p.m. Annual general meeting.

Society of Chemical Industry.—Friday, November 14th. Joint meeting with the Newcastle section. 3.50 p.m. Visit to the Carville power station of the Newcastle-upon-Tyne Electric Supply Co. 6.30 p.m. Armstrong College, Newcastle. "Caustic Embrittlement." Mr. W. S. Coates.

Illuminating Engineering Society.—Friday, November 14th. Royal Society of Arts, John Street, Adelphi, W.C. 6.30 p.m. "The Lighting of Offices and Public Buildings." Mr. J. A. Macintyre.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of makers of the following devices:—

HALO mirrors.

Small electric boot polishers for private house use.

Notes.

The O.L.A. Supper-dance.

One of the most successful and enjoyable social functions of the season took place on October 31st at Messrs. Harrods' Georgian Restaurant, Knightsbridge, where the Overhead Lines Association held its third annual conversazione and supper-dance. Amongst the guests Mrs. Allen (widow of the late Mr. A. H. Allen, for many years technical editor of the ELECTRICAL REVIEW) and Miss Constance Allen, Major C. Coad (Air Ministry), Capt. E. T. Morris (president, National Farmers' Union), Mr. and Mrs. Griffin (Council for the Preservation of Rural England), Mr. and Mrs. Nimmo (Electricity Commission), Lt.-Col. W. A. and Mrs. Vignoles, Mr. W. M. Mordey, Mr. W. Donkin, Mr. and Mrs. P. F. Rowell, Mr. J. M. Kennedy, and Dr. A Ekstrom were noticed.

As Mrs. Bexon was unable to be present, the guests were received by Mr. Wm. C. Bexon (president) and Mrs. J. H. C. Brooking, who kindly consented to act as hostess. The undermentioned companies displayed exhibits:—

Allan Wright, high-voltage cable fittings.
Bettre Lines Co., patent cross-arms and photographs of line construction.
British Thomson-Houston Co., line fittings.
Bullers, Ltd., "Hewlett" 132-kV insulators.
British Aluminium Co., conductors and joints.
British Porcelain Co., insulators.
Callender's Cable & Construction Co., model line towers and "K" poles.
Croydon Cable Works, Ltd., "Pernax" insulation.
Evershed & Vignoles, Ltd., resistance and earth testers.
Edison Swan Co., telephone-line protectors.
Electrical Equipment & Carbon Co., line fittings.
Electric Control, Ltd., extra-high-voltage fuses.
F. J. Down, anchors, grips, switch-fuses, and fittings.
Griffith Bros., "Ferrodor" paint.
Johnson & Phillips, Ltd., pole-top equipment and oil switch.
James A. Jobling & Co., "Pyrex" glass insulators.
Long & Crawford, Ltd., rotary oil switch-fuse.
Le Bois Bakelisé, bakelised wood fittings and operating pole.
Pirelli-General Cable Co., wooden pole-top equipment.
Standard Switchgear, Ltd., switchgear.
Steatite & Porcelain Products, Ltd., steatite insulators.
Thos. Bolton & Sons, conductors.
Taylor Tunnicliffe & Co., insulators and switchgear.
Venner Time Switches, Ltd., time switches.
Zinc Alloy Rust Proofing Co., "Sherardised" fittings.

The Electrical Association for Women was represented, and there was also on view a collection of photographs and drawings, furnished by members of the O.L.A. and by exhibitors, which illustrated modern practice in rural distribution by overhead lines.

A Diesel-electric Coaster.

Messrs. MacBrayne have placed an order with Messrs. Wm. Denny & Bros., Ltd., Dumbarton, for a new vessel for their Oban-Staffa-Iona summer service and Gourock-Ardrishaig winter service. Her length will be 215 ft., and, according to the *Motor Ship*, she will be propelled by twin-screws on the Diesel-electric principle.

Supervising Electrical Engineers.

In his presidential address to the Association of Supervising Electrical Engineers on October 21st, Mr. S. B. Donkin, M.Inst.C.E., M.I.Mech.E., M.I.E.E., dealt with the second World Power Conference, which was held in Germany (Berlin, June 16th to 25th), on similar lines to the commentary that appeared in our pages at the time. His lasting impression was of the excellent organisation, ample accommodation, and the absence of any failure to complete the work arranged for. If it were possible to criticise the Conference, the criticism would be, in his opinion, that the whole thing was too large, was attended by too many delegates, and that too many speakers took part in the discussions to permit time for inter-discussion, or to enable all contributions to be heard. Mr. Donkin inclined to the opinion that the Sectional Conferences produced better and more useful results by being able to allow more time to be devoted to the subjects of the particular section under consideration.

Special Cathedral Lighting.

The accompanying illustration is a night view of Hereford Cathedral illuminated by floodlights during the Three Choirs Festival Week, September 7th to 13th. The lighting is the work of the Shropshire, Worcestershire and Staffordshire

Hereford Cathedral Floodlighted.

Power Company, and four sets of five B.T.-H. flood-lighting projectors, each containing a 1,000-watt lamp, placed at different points in the Cathedral grounds, were employed. Special "Holophane" lighting was used for the chorus and orchestra inside the Cathedral, the work being carried out by Messrs. Harding Bros., Ltd.

All-electric Street Lighting.

The following is a list of boroughs and towns in Great Britain in which the street lighting is at present all-electric, and which are referred to in the leading columns of this issue:—

LONDON.
Barking
Erith
Hackney
Hampstead
Ilford
Leyton
Poplar
Stepney
Walthamstow
Willesden
Wimbledon

PROVINCIAL.
Annfield Plain
Aylesbury
Amble
Barrow-in-Furness
Basingstoke
Bedford
Brighton
Bury St. Edmunds
Canterbury
Cheltenham
Chester
Cranbrook
Dorking
Epsom
Eastbourne
Eston
Fleetwood
Frant
Great Yarmouth
Hastings
Hawkhurst
Kirkwall
Leatherhead
Lytham-St. Annes
Maldon
Mevagissey
Mexborough
Motherwell and Wishaw
Newton Abbot
Norwich
Nuneaton
Paisley
Sale
Skelton & Brotton
Stretford
Sunderland
Sleaford
Tenterden
Watford
Welwyn Garden City.

The *Morning Post* reports that Mr. H. Woodall, in his presidential address to the conference of the British Commercial Gas Association at Bridlington on October 28th, said:—"In these days when everyone is calling for economy, it does seem rather outrageous that all over the country gas lighting in our streets is being displaced at very great cost by less efficient electric lighting."

E.P.E.A. National Technical Groups.

LONDON LOCAL GROUP.—The first meeting of this group took place on October 28th. The following further lectures have been arranged for this session. Meetings will be held at the Junior Institution of Engineers, 39, Victoria Street, London, S.W.1, unless otherwise stated:—November 11th, 1930. "Fault Locating Methods and Instruments," by T. W. Corbin. November 25th, 1930. "Power Plant Equipment between the Condenser and the Boiler," by H. Hillier. December 9th, 1930. "Cable Troubles, How to Prevent and How to Overcome," by L. R. Lee. January 13th, 1931. "The Dismantling, Transportation, and Erection of Heavy Machinery," by Norman E. Box. January 27th, 1931. "Automatic Boiler House Control," by W. G. Thomas. February 10th, 1931. "132,000-Volt Cables," by Pirelli-General Cable Co., Ltd. February 24th, 1931. "Grit Catching," by Professor Gibbs. March 17th, 1931. "E.h.t. Circuit Breakers, &c.," by R. L. Morrison (at Institution of Electrical Engineers). March 24th, 1931. "Water Heating by Electricity," by H. G. W. Haslett. February 28th, 1931. Annual dinner and dance (Café Royal, Regent Street).

Appointments Vacant.

Electrical foreman for Gambia Public Works Department.

Mechanic to take charge of power station and cold storage plant for the Government of Dominica.

Charge engineer (£370) at Padiham power station for the Lancashire Electric Power Co.

Assistant engineer for Distribution Department for the China Light & Power Co. (1918), Ltd.

Temporary mains assistant for Barking Electricity and Tramways Department.

Engineer and manager for Clitheroe Corporation electricity undertaking.

(See our advertisement pages to-day.)

Accident.

A travelling crane at the London Power Co.'s works at Nine Elms, S.E., collapsed on November 4th, killing two workmen.

The Batti-Wallahs' Society.

The following luncheons have been arranged:—

Wednesday, November 12th.—Chief guest, the Rt. Hon. the Earl of Inchcape, G.C.S.I., G.C.M.G., K.C.I.E., &c. Subject: "Marine Electrification."

Thursday, December 11th—Chief guest, Sir Philip Dawson, M.P. Subject: "Railway Electrification in England."

Both will be held at the Hotel Metropole at 12.30 for 1 p.m.

The occasion on which the Earl of Inchcape will be the chief guest will be approximately 25 years after the Society was formed, as it was at the beginning of December, 1905, that Messrs. E. L. Pinching, Walter Riggs, and E. Sheppard lunched together and discussed Mr. L. M. Waterhouse's idea of drawing together ex-P. & O. Batti-Wallahs, and formed the provisional committee for the purpose. It is therefore most appropriate that the chief of the P. & O. Company should be guest of honour on such a significant occasion.

Bulk Supply and Engineers' Salaries.

At its last week's meeting the Ilford Borough Council passed without opposition the following resolution: "That, in view of the altered conditions in commercial circles in England to-day, this Council is not prepared to agree to the proposed revised scale of the Incorporated Municipal Electrical Association, and hereby gives formal notice that the Ilford Borough Council withdraws from any participation in the present scale." The resolution arose out of an objection raised at the previous meeting to paying the engineer an increase of salary according to the increased consumption of energy. Alderman F. H. Dane, who moved the resolution, drew attention to the fact that the I.M.E.A. had decided that it would not go forward with its revised scale at present, and said the Association's decision showed that the majority of the undertakings had come to the same conclusion that had been arrived at by Ilford—that the time was not opportune for increasing the wages of anyone. He had discovered that there was a considerable number of authorities who had not been paying the scale for as long as Ilford had been paying it. The real reason why he had put forward the resolution was that as a commercial man he knew that the affairs of commercial England were in such a condition that no one could say what was going to happen in the next six months. Under those conditions it was not fair to pledge the Council to increases of salary in the years to come. He wanted the Council to say that it would decide for itself what the salaries of its officers should be. It was not for the sheltered industries to say what they wanted and tie the Council down—it was a question of what the ratepayers could afford. Councillor Spencer, who seconded the resolution, said he did so because he considered that the basis of the schedule was wrong. It was based on the generation of current and Ilford happened to be an authority which purchased more than ten times as much energy as it generated. The undertaking had a monopoly and got its customers with little or no trouble. The Council should not be pledged, therefore, to pay according to the energy consumed.

The E.A.W.

The first annual dinner of the Hartlepools and District Branch of the Electrical Association for Women took place at the Grand Hotel, West Hartlepool, on October 31st, when Mrs. J. W. Wilson presided over a large company, including the Mayors of the twin boroughs. The toast of the E.A.W. was proposed by Mr. J. H. Parker, electrical engineer to the London County Council tramways, and Miss C. Haslett, director E.A.W., in reply, said that in the future the very few domestic servants that would be required would have to be experts in the management of electrical appliances.

The bachelor girl's flat which will be shown by the Association at the Bachelor Girls' Exhibition, November 12th to 21st, sets out to show how the professional or business woman can live at a moderate rate in a comfortable, artistic, flat with the aid of electricity. The flat, designed by Miss Mosely, A.R.I.B.A., consists of a lounge with electrically-heated walls, thermostatically controlled; a dining recess equipped with many useful appliances so that the occupier may quickly and easily prepare her breakfast; a kitchen where her larger cooker for entertaining stands near her refrigerator; a bedroom complete with electric curling tongs and bedwarmer; and a bathroom warmed by a heater in the roof, with a constant supply of hot water. The Association, in conjunction with the British Electrical Development Association, planned the electrical equipment, products of most British electrical manufacturers being used.

A feature of the exhibition will be cooking competitions organised and judged by the Good House-keeping Institute. Four classes of an "Unexpected Guest Competition" will require dinners cooked for two in one hour at the Exhibition on, respectively, a gas, electric, or oil stove. In connection with Class 3, two prizes, £15 and £10, are being offered by the British Electrical Development Association, Inc., and it is desired that no less than 40 entries should be made for this class of the competition; indeed, all lady electrical demonstrators in the London and Home Counties should enter. Entries, on forms which may be obtained from the Director, Good House-keeping Institute, 49, Wellington Street, W.C.2, should be sent to the director immediately. A "Home Cake Baking Competition" will also be held.

Electric Clock Lecture.

The British Horological Institute, Northampton Square, Clerkenwell, announces a lecture by Mr. Frank Hope-Jones, M.I.E.E., F.R.A.S., on November 12th, on "Free Pendulum Clocks for Every Day Use." It has been said that he has spent his life in getting rid of the wheels of the clock. The one in the South Kensington science museum is short of two, but it still goes, and is treasured as the germ of electrical time service. Every few years he got rid of another wheel, and the time-keeping was improved as the clock was simplified, until in 1905 there was only one left. In that form the "Synchronome" master clock established electrical time service as a reputable branch of the profession of the electrical engineer. In 1922 the last wheel was displaced with the help of Mr. W. H. Shortt, M.Inst.C.E., who designed a "Synchronome" clock which broke all records for accuracy in 1924, and has measured the time of the world at Greenwich and other observatories ever since; but it was an expensive instrument and required the services of a slave clock. Now, thirty-five years after the filing of his first patent, the lecturer is to introduce a "wheel-less synchronome" master clock, which, while retaining the salient features of the expensive astronomical instrument, will be within the reach of all. Its pendulum is *free*, except for very slight magnetic interference at zero, at the point where the pendulum passes through the middle of its swing, where "interference" does not matter. The result is that the ordinary "Synchronome" master clock, always remarkable for its time-keeping, is claimed to have been raised to the level of observatory standards.

Institution Notes.

Institution of Electrical Engineers.

NORTH-MIDLAND CENTRE.—In his inaugural address as chairman of the North-Midland Centre at Leeds on October 28th, Mr. H. G. Fraser, of Wakefield, considered some of the factors which tended to raise the price of electricity. He mentioned the high cost of laying underground cables, and suggested it was conceivable that at some not very distant date the pendulum of public opinion would swing over sufficiently far to allow of some form of overhead distribution in the more congested areas. The cost of serving housing estates with underground mains and services was out of all proportion to the revenue which they produced, by reason of the fact that the houses were invariably built with a strip of garden both back and front, and in pairs or occasionally in blocks of four. Mr. Fraser also made a plea for standardisation as a valuable aid to low cost of production, and convenience of interchangeability.

IRISH CENTRE.—Mr. T. J. Monaghan occupied the chair on October 30th, when Mr. F. H. Whysall, city electrical engineer of Belfast, delivered his inaugural address at Dublin as chairman of the Irish Centre. In referring to the benefits of membership he remarked that only 110 members were resident in the Free State and 60 in Northern Ireland. He advised engineers to take special interest in the financial aspect of their undertakings. Mr. L. J. Kettle moved a vote of thanks, which was seconded by Mr. Marshall Harriss and supported by Dr. T. A. McLaughlin, managing director of the Free State Electricity Supply Board, who remarked that electricity knew no boundaries, a commonplace statement of fact recognised by the Governments and peoples of Europe. Switzerland interchanged energy with France and Italy and with Germany. Switzerland exported ten times as much electricity as the whole Free State consumed. Germany exported electricity to Austria, and Sweden to Denmark. Should they, he asked, see the day, therefore, when Belfast and Dublin would be interconnected, and when electrical development in that country would follow the lines taken in Europe? Inter-connection between Belfast and Dublin would mean cheaper electricity for the citizens of both places, and he felt that the realisation of that simple economic fact by the people of Northern Ireland and the Free State must result in inter-connection. His one ambition in connection with the Shannon River hydro-electric scheme was to see inter-connection with the North.

INFORMAL MEETING.—The first informal meeting of the 1930-31 session was held on October 27th, when the president, Mr. C. C. Paterson, O.B.E., opened a discussion on "The Link between Sales, Research, and Production," taking as his text a passage from a report by Faraday. The sales engineer should not be a man merely to obtain orders, he must generally be capable of sharing the responsibility of advising as to the kind of product which should be developed for the future. The research group was often made responsible to a manager who might be excellent as such, but entirely the wrong man to whom to make a research group responsible. His knowledge of his factory probably gave him much too definite an idea of what he wanted the group to do, which was very likely not research, but work which the factory personnel should tackle. Research men should have a fairly free hand in the choice of the work which they undertook, and be held responsible for its ultimate usefulness. Correct relationships could be brought about by organising for the psychological as much as for the physical, and by organising a systematic and sympathetic liaison between all concerned, the production technical personnel as well as its management, with the research workers as well as their director. Regular meetings, not specially to discuss research work, but to review with a view to development and investigation all the technical features of the product and its performance and the processes of its manufacture, made all concerned conscious of having a share in the responsibility for new developments, and helped sympathetically in the evolution and establishment of innovations.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. Percy E. Rycroft, M.B.E., M.I.E.E., has resigned his position with Messrs. Babcock & Wilcox, Ltd., to accept the appointment of chief engineer and manager of the Great Yarmouth Corporation electricity undertaking. There were 93 applicants for the appointment. Yarmouth (South Denes) is a selected station and important developments are pending. Mr. Rycroft is well-known in the electricity supply world. He had had several years' service with both company and municipal undertakings before joining Messrs. Babcock & Wilcox. He was for some time connected with the Board of Trade Coal Mines Department.

We reproduce herewith a portrait of **Mr. N. V. Everton,** who, as we reported in our issue, has been appointed sales manager of the Lamp Sales Department of the Metropolitan-Vickers Electrical Co., Ltd.

Mr. N. V. Everton.
Manager of the Metro-Vick Lamp Sales Department.

We learn officially that **Mr. G. F. Nayler,** the electrical engineer and tramway manager of Nelson, Lancs., has been asked to resign by the Electrical, Light Railways and Omnibus Committee. The Committee's action will be submitted to the Council for approval.

Mr. C. S. Taylor, whose portrait appears herewith, is the successor to Mr. T. H. U. Aldridge, as the chief of the Shanghai electricity undertaking. Subsequent to his engineering training, Mr. Taylor occupied the position of distribution engineer in the Watford Corporation Electricity Department for a number of years. Following this, he became assistant engineer and manager to the Hendon Electric Supply Co., Ltd. In 1913 he joined the Shanghai Municipal Electricity Department in the capacity of assistant sub-station engineer, subsequently serving as sub-station engineer and power engineer. He was appointed to the position of deputy engineer-in-chief and manager in 1922. He became vice-president and general manager to the Shanghai Power Company in December last year. Mr. Taylor anticipates proceeding to the United States and Great Britain during the course of the next few months in connection with plant extensions and kindred matters. Communications intended for him during his visit may be addressed to Messrs. John Pook and Co., 68, Fenchurch Street, E.C.3.

Harrods.] **Mr. C. S. Taylor.**
Chief of the Shanghai Electricity Undertaking.

Mr. Herbert Scott, who is in business as an electrical engineer in Ashton-under-Lyne, was married to Miss C. Fogerty, of the same town, on October 21st.

On the appointment of **Mr. H. F. McLoughlin** as managing director of Simplex Conduits, Ltd., **Mr. John Huntington,** formerly London district manager, becomes general manager of the company. Mr. Huntington will be succeeded by **Mr. J. W. Ward,** hitherto assistant London district manager.

Mr. R. L. Shellard has been appointed a representative of Simplex Conduits, Ltd., and is attached to the Bristol branch.

Mr. H. G. W. Haslett has been appointed sales director of Chesterton, Jones & Co., Ltd., Biringham, with a seat on the board.

Mr. F. Nicholls, borough electrical engineer of Derby, was presented with a mahogany floor standard and shade, and a china coffee set, at the recent annual dinner of the Derby and District Section of the Electrical Power Engineers' Association, held in Nottingham. Mr. Nicholls was secretary for six years, and has served for four years as chairman of the Section.

Mr. R. G. Kendall, for four and a half years sales engineer with the Ayrshire Electricity Board, has been appointed sales engineer to the Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Company. Mr. Kendall was educated at Christ's Hospital School, Sussex, and the Central Technical College, London, and he obtained further experience with the Clyde Valley Electrical Power Company; as a transformer, motor and switchgear sales representative in Glasgow; and with Messrs. Balfour, Beatty & Co., Ltd., on the Lochaber contract.

Mr. H. B. Reynolds, engineer and plant superintendent of Messrs. Babcock & Wilcox, Ltd., was recently presented on behalf of the staff and workmen with a portable wireless set, and a silver tea service for Mrs. Reynolds, on the completion of 36 years' service with the company.

Mr. E. J. Doran, traffic manager of the Sydney tramways, who is retiring on reaching the age limit of 65, was recently entertained at a dinner by officers of the tramway traffic branch and presented with a set of crystal glass.

Mr. E. S. Rayner, general manager and engineer of the Hull Corporation tramways, **Mr. G. J. Brace,** works superintendent, and **Mr. H. D. Ingram,** assistant engineer, who, by a resolution passed at a special meeting of the City Council, were called upon to resign their positions, have written to the town clerk declining to hand in their resignations, states the *Manchester Guardian*. This development will be considered by the Tramways Committee. A motion has been tabled for the rescission of the resolution.

Mr. Haydn T. Harrison has removed to 4, Iddesleigh House, Iddesleigh Gardens, Victoria Street, S.W.1; his telephone number is still "Victoria 2943."

Mr. C. Sykes, electrical superintendent of the central area for the Newcastle-on-Tyne Electric Supply Co., Ltd., and its associated companies, is taking up an appointment in the Central Electricity Board's Central England Area. He has been with the Newcastle Company for 27 years.

Mr. H. C. Wollaston, B.A., A.M.I.E.E., for a number of years on the London sales staff of the English Electric Co., Ltd., has left the company.

Mr. Norman M. MacElwee has been appointed by the Council of the University of Birmingham to a lectureship in mining electrical engineering. He was formerly on the staff of the Royal Technical College, Glasgow, where he took his degree, and he has lectured on electrical engineering at the Armstrong College, Newcastle-upon-Tyne.

On Monday afternoon, at a general meeting of members of the Royal Institution, thanks were returned to **Lord Melchett** for his gift of a replica of the panel in the entrance door of Imperial Chemical House representing **Faraday** lecturing in the Royal Institution.

Obituary.

Mr. J. A. Goodall.—The death occurred at his home, in Plymouth, on October 31st, after a few days illness, of Mr. Joseph Alwyn Goodall, of Plymouth Electricity Department. Mr. Goodall, who was a native of Sheffield, was 53 years of age. He had been associated with electricity supply in Plymouth and Devonport for 28 years. He became deputy engineer under Mr. Sparks, and afterwards, on the amalgamation of the three towns of Plymouth, Devonport, and Stonehouse, he was placed in charge of the Newport Street power station. For the past two-and-a-half years he had occupied the position of consumers' engineer. Mr. Goodall had for long been connected with the Electrical Power Engineers' Association, and at the time of his death was chairman of the Devon and Cornwall Section.

Mr. P. E. Hart.—The *Bulletin* of the Hydro-Electric Power Commission of Ontario records the death, on September 9th, of Mr. Percival E. Hart, chief engineer of the Toronto Hydro-Electric System. Mr. Hart was born near Plymouth, Devon, in 1870, and after being educated at the School of Science, Cardiff, went to Canada in 1888 to take charge of the plant of the Brandon (Manitoba) Electric Light Co. He later served with the Canadian General Electric Co., leaving that company in 1913 to become an electrical engineer with the Toronto Hydro-Electric System.

Mr. E. Rousseau.—Old Finsbury Technical College men will learn with regret of the death of Mr. E. Rousseau, who was an instructor in electrical engineering at the College, which occurred on October 28th.

Mr. G. S. Haydon.—The death occurred on November 2nd of Mr. Gerald S. Haydon, who was formerly engineer at the North Wilford power station, Nottingham. Mr. Haydon, who was 44 years of age, had had a wide and varied experience at home and abroad, including the West Coast of Africa, Argentina, and Portugal. He acted as supervising engineer during the construction of the North Wilford station.

Will.—The late **Mr. Louis P. Lightstone,** a director of the Ever Ready Co. (Great Britain), Ltd., left estate valued at £41,590 gross (£12,567 net personalty).

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares.

New Companies Registered.

All-Electric House Co., Ltd.—Private company. Registered November 3rd. Capital, £3,000 in £5 shares. Objects: To build houses fitted with electrical equipment and plant; to manufacture and deal in electrical apparatus and goods of all descriptions, &c. The first directors are: H. E. Walker, 64, Anchorage Road, Sutton Coldfield, electrical engineer; E. A. Reynolds, M.A., M.I.E.E., The Summit, Rednal Road, Kings Norton, electrical engineer; W. Donovan, A.M.I.E.E., The Hawthorns, Birmingham Road, Wylde Green, electrical engineer. Secretary: H. Keeling. Registered office: 109, Colmore Row, Birmingham.

Ultimate Processes, Ltd.—Private company. Registered October 29th. Capital, £600 in 170 "A" ordinary and 30 "B" ordinary shares of 10s. each, and 500 8 per cent. cumulative preference shares of £1 each. Objects: To carry on the business of manufacturers of and dealers in and agents for scientific, wireless, and electrical and mechanical instruments and appliances of all kinds, mechanical and electrical engineers, &c. The subscribers are:—O. D. Lucas, 49, Linden Gardens, W.2, engineer; B. A. Levinson, 199, Piccadilly, W.1, solicitor. The first directors are to be appointed by the subscribers. Solicitors: Bartlett & Gluckstein, 199, Piccadilly, W.1.

Bloomsbury Supply Co., Ltd.—Private company. Registered October 25th. Capital, £250 in £1 shares. Objects: To carry on the business of general electrical dealers in all its branches. The first directors are:—W. Fone, 70, Theobalds Road, W.C.1, merchant (chairman and permanent director); F. Bradbury, 40, Manchester Road, N.15, clerk. Registered office: 70, Theobalds Road, W.C.1.

Majestic Distributors (Northern), Ltd.—Private company. Registered October 29th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers and distributors of and agents for the sale of and dealers in radio and electrical apparatus, sound-reproducing machines, &c. The first directors are: J. A. Somerville, 2, Grosvenor Drive, Whitley Bay; G. Ridley, 55, Grosvenor Drive, Whitley Bay. Registered office: 1, Saville Place, Newcastle-upon-Tyne.

Rite Stores, Ltd.—Private company. Registered October 27th. Capital, £1,000 in £1 shares. Objects: To adopt an agreement with F. A. Morton, and to carry on, develop and turn to account the business and assets comprised therein, and to carry on the business of manufacturers and repairers of and dealers in all kinds of electric or gas lamps, electrical machinery and other electrical or gas apparatus, &c. The directors are: A. Ripley, Thornhill House, Upper Wortley, Leeds; E. F. Taber, 77, Dawlish Road, Leeds. Secretary: A. Ripley. Registered office: The Arcade, Austhorpe Road, Crossgates, Yorks.

British General Gas and Electricity Co., Ltd.—Public company. Registered October 31st. Capital: £200,000 (47,000 6 per cent. cumulative redeemable preference and 145,000 ordinary shares of £1 each and 160,000 deferred ordinary shares of 1s. each). Objects: To investigate and examine into businesses and undertakings whether publicly or privately owned, to acquire and hold shares, stocks, debentures, and debenture stocks, bonds, obligations and securities, and to carry on the business of colliery proprietors, furnace owners, gas makers and suppliers, &c.; also that of an electric light and gas works company, &c. The subscribers are: L. W. Shaw, Clarendon Lodge, Thornton Heath, Surrey; A. S. Pool, 57, Dorothy Road, Battersea, S.W.11, solicitor's clerk; and five others. Solicitors: Ince, Colt, Ince & Roscoe, 10-11, Lime Street, E.C.

Grantown-on-Spey Electricity Supply Co., Ltd.—Public company. Registered October 31st in Edinburgh. Capital, £20,000 in £1 shares. Objects: To carry on the business of an electricity supply and gas company. The subscribers are:—G. Anderson and Mrs. Margaret Anderson, Gordon Hall, Grantown-on-Spey; J. G. Anderson and Mrs. Alice Anderson, 13, Castle Road East, Grantown-on-Spey; Dr. George M. Anderson, 204, Platt Lane, Rusholme, Manchester; A. A. Watson, 1, Brick Court, Temple, E.C.; and Mrs. M. J. Watson, 53, Glebe Road, S.W.13. Solicitors: Shepherd & Wedderburn, 16, Charlotte Square, Edinburgh.

Blackpool Radio Installation Co., Ltd.—Private company. Registered October 31st. Capital, £1,000 in £1 shares (500 10 per cent. cumulative preference and 500 ordinary). Objects: To carry on the business of electrical, wireless, mechanical and general engineers, &c. The directors are: T. L. Foreman, 41, Moorland Road, Didsbury, Manchester, stockbroker; N. Naylor, 25, Kirkham Avenue, Blackpool, estate agent. Solicitor: L. Robinson, Blackpool.

Official Returns of Electrical Companies.

Pollopas, Ltd.—Debenture and trust deed both dated September 27th, 1930, to secure £25,000 and premium of 5 per cent. or 10 per cent., as the case may be, charged on the company's undertaking and property, present and future, including uncalled capital, goodwill and certain patents, &c. Trustees: W. S. Rothera, Friar Lane, Nottingham; S. Blythen, Low Pavement, Nottingham; and H. R. Gillespie, Carisbrooke Drive, Nottingham.

Macintosh Cable Co., Ltd.—Particulars filed of £350,000 first mortgage debenture stock authorised August 27th, and covered by trust deed dated October 9th, 1930, the whole amount being now issued. Property charged: Properties in Derby, Markeaton and Normanton, and the company's undertaking and property, present and future, including uncalled capital. Trustees: Law Debenture Corporation, Ltd.

Electrical Components, Ltd.—Mortgage dated August 21st, 1930, to secure £7,500, charged on 101, 102, and 103, Snow Hill, and 88, 89, and 90, Great Charles Street, Birmingham. Holder: H. Bloxham, Snow Hill, Birmingham. (Registered October 18th by permission of the Court.)

"M.P.A." Wireless (1930), Ltd.—Issue on September 30th, 1930, of £500 debentures, part of a series already registered.

Brentwood District Electric Installations, Ltd.—Mortgage dated October 15th, 1930, to secure £4,500, charged on 83, and 85, High Street, and 1-9 (inclusive) Cottage Place, Brentwood. Holders: J. W. Vincent, G. B. Anderson and S. B. Anderson, all of 53, New Broad Street, E.C.

British Quain Sunlight, Ltd.—Particulars filed of £2,000 debentures authorised September 18th, 1930, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £960.

Shoreham and District Electric Lighting and Power Co., Ltd.—Satisfaction to the extent of £1,200 on October 13th, 1930, of £10,000 ten-year notes authoirsed May 22nd, 1928, and registered August 10th, 1928.

International Electric Co., Ltd.—Satisfaction in full on February 2nd, 1923, of instrument of charge dated October 10th, 1918, and registered October 14th, 1918. Notice filed October 22nd, 1930. (According to the register of mortgages, the instrument of charge registered October 14th, 1918, originally secured £600.) J. J. Ure, 11a, Hart Street, Bloomsbury, was appointed receiver and manager on October 21st, 1930, under powers contained in debentures dated October 12th, 1923.

J. T. Kemp, Ltd.—R. B. Baggaley, Commerce Chambers, Parliament Street, Nottingham, ceased to act as receiver and/or manager on September 5th, 1930.

Claude Lyons, Ltd.—Capital, £500 in £1 shares. Return dated October 3rd, 1930. 430 shares taken up. £280 paid. £150 considered as paid. Mortgages and charges, nil.

Peterhead Electricity Co., Ltd.—Capital, £5,000 in £1 shares. Return dated June 25th, 1930. All shares taken up. £5,000 paid. Mortgages and charges, nil.

Ellis & Mort, Ltd.—Return dated September 5th, 1930. Capital, £12,000 in £1 shares. All shares taken up. £7,120 paid. £4,880 considered as paid. Mortgages and charges, nil.

Microfuses, Ltd.—Capital, £100 in £1 shares. Return dated July 4th, 1930. All shares taken up. £100 paid. Mortgages and charges, nil.

Frank Raworth, Ltd.—Capital, £3,000 in £1 shares. Return dated August 12th, 1930. 2,222 shares taken up. £2,022 paid. £200 considered as paid. Mortgages and charges, nil.

Herne Bay and District Electricity Supply Co., Ltd.—Capital, £120,000 in 100,000 ordinary and 20,000 deferred shares of £1 each. Return dated July 29th, 1930. 64,006 ordinary and 20,000 deferred shares taken up. £59,604 16s. paid, being £1 per share on 42,000 ordinary and 16s. per share on 22,006 ordinary shares. £20,000 considered as paid on the deferred shares. Mortgages and charges, £20,000.

Revy Phillips & Co., Ltd.—Debenture dated October 14th, 1930, to secure £170, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: J. W. Revy, Kenley Woodmansterne Road, Carshalton.

Griffin, Harding & Bryant, Ltd.—Capital, £3,500 in 2,000 preference, 1,400 ordinary, and 100 founders' shares of £1 each. Return dated August 28th, 1930. 1,109 preference, 1,400 ordinary, and 100 founders' shares taken up. £1,309 paid on 1,109 preference and 200 ordinary shares. £1,300 considered as paid on 1,200 ordinary and 100 founders' shares. Mortgages and charges, nil.

Partridge & Mee, Ltd.—Capital, £4,000 in £1 shares. Return dated June 5th, 1930. 2,405 shares taken up. £2,405 paid. Mortgages and charges, nil.

"K.N." Electrical Products, Ltd.—J. M. Ferguson, Staple Inn Buildings, Holborn Bars, E.C., ceased to act as receiver on May 26th, 1930.

D.X. Coils, Ltd.—Capital, £250 in 1,000 ordinary shares of 1s. and 200 preference shares of £1 each. Return dated February 20th (filed September 3rd), 1930. All shares taken up. £200 2s. paid; £49 18s. considered as paid. Mortgages and charges, nil.

Langs (Wimbledon), Ltd.—Capital, £3,000 in £1 shares (increased from £1,000 in March, 1930). Return dated December 2nd, 1929 (filed July 2nd, 1930). 1,000 shares taken up. £1,000 paid. Mortgages and charges: £500. A return of allotments, made up to April 2nd, 1930, shows a further 2,000 shares allotted, payable in cash and fully called up.

Johnson & Tanner, Ltd.—Capital, £2,000 in 1,000 preference shares of £1 and 20,000 ordinary shares of 1s. each. Return dated June 21st, 1930. All shares taken up. £1,000 paid on the preference shares; £1,000 considered as paid on the ordinary shares. Mortgages and charges: £1,050.

Elektromekano Co. (London), Ltd.—Capital, £100 in 1s. shares. Return dated September 1st, 1930. All shares taken up. £100 paid. Mortgages and charges, nil.

Finnell System, Ltd.—Capital, £3,000 in £1 shares. Return dated August 6th, 1930. All shares taken up. £3,000 paid. Mortgages and charges, nil.

L. E. Wilson & Co., Ltd.—Capital, £2,000 in £1 shares. Return dated May 14th, 1930. 1,601 shares taken up. £1,061 paid. Mortgages and charges, nil.

Wilrose Co. (Birmingham), Ltd.—Capital, £100 in £1 shares. Return dated May 26th (filed June 4th), 1930. 75 shares taken up. £75 paid. Mortgages and charges, nil.

W. H. Porter & Co., Ltd.—Capital, £100 in £1 shares. Return dated May 26th (filed June 4th), 1930. 90 shares taken up. £90 paid. Mortgages and charges, nil.

City Notes.

Drake & Gorham, Ltd.

The annual meeting was held on October 31st, Mr. B. M. Drake (chairman) presiding. In presenting the report and accounts (ELECTRICAL REVIEW, October 31st, p. 745), the chairman said they were able to show improved results, and the total profits would have been greater but for the loss incurred by the department formed to work the agency for "Duro" water softeners imported from America. The relinquishing of this agency was under discussion. The turnover of the London department increased by 133 per cent., and there was an advance on the work in hand. The Manchester office had suffered from the cotton depression, but had supplemented contracting with the running of an electric news sign and the supply of electric signs of various descriptions. The Lancashire Cotton Corporation had entrusted to them a large portion of its electrical work. During the year they had extended their policy of manufacturing and the building of new works, which would enable them to produce high-pressure switchgear at competitive prices. This factory was twice the size of the premises previously occupied, and provision had been made for future requirements. They were now in a position to consider agency applications from abroad for their patented switchgear. The problem of finance had been temporarily met by assistance from the bank, but as it was evident that further capital could be usefully employed, the directors were considering the best course to adopt. Steps might be taken to obtain a Stock Exchange quotation which would widen the interest taken in the company. During the year a good deal of preparatory and subsidiary work was carried out in connection with the second section of the Bank of England building. It was not anticipated that the Bank would be finished for five or six years, so they could look forward to steady employment for a large staff during this period. The installation which they had carried out at Lloyd's Bank head offices was regarded as one of the most up-to-date examples of the utilisation of electricity. They had installed over 8,000 lights in workmen's houses for the Fixed Price Light Co. in the Poplar area, and were now engaged on a further contract in Willesden. They were constantly improving the organisation for keeping in touch with their clients and assisting them to get the best results from their installations. They had completed all the cable work for the new 6,600-V turbo-generator set and for the auxiliary equipment in the engine and boiler house at Guildford power station. Although they had ceased to manufacture wireless apparatus, they were constantly fitting up buildings and private houses with sets. The report and accounts were adopted.

Young Accumulator Co. (1929), Ltd.

The first annual meeting was held on October 28th, Mr. E. H. F. Reeves, chairman, presiding. In presenting the report and accounts the chairman said that on the formation of the company, the first task was the preparation and equipment of a new factory in order to permit them to manufacture on a commercial scale. The new factory was not ready for occupation until the end of September, 1929, but even at that date a considerable amount of work still remained to be done in the way of equipment to complete fully their programme. They had acquired the valuable licence to manufacture and sell the Wilderman patent ebonite separators. The plant required for this manufacture was very special and it took a considerable time to obtain delivery. Regarding sales, with the depressed state of trade which had steadily been getting worse, it was no easy task which confronted their sales organisation when finally they were able to say that the manufacturing side of the business was ready to go ahead. The result of their efforts was that to-day they had some 200 agents in this country handling their products, and their output was now about 2½ times the output of the factory in June. The net adverse balance of £28,774 included the cost of experiment work and development, in addition to depreciation. The board was definitely of the opinion that they had got through the difficulties, delays and disappointments attaching to the equipment and starting up from small beginnings of an important manufacturing business and the building up of a turnover under adverse trade conditions. The report and accounts were adopted.

Gramophone Co., Ltd.

In the course of his address at the annual meeting on October 28th, Mr. A. Clark (chairman) said last year they purchased from Marconi's Wireless Telegraph Co., Ltd., their business and existing rights in certain fields, including radio. They paid as the purchase price 20,000 ordinary shares and an amount in cash based upon an independent valuation of the assets acquired, which included land, buildings, plant and machinery, and stock-in-trade. The purchase had already resulted in a satisfactory profit to the company, and they believed that, given only normal trading conditions, they could expect an expanding profit. Through this purchase they had obtained a share in the royalties collected by the Marconi Co. from the trade for the use of radio patents. They had also acquired important interests in the manufacture of radio valves, and that business, including the sale of valves under the Marconi trade mark, was increasing. The sales of radio receiving sets and accessories for the past year showed a considerable advance over those made in the previous year by the Marconi Co., but while the sales were greater, the percentage of profit on radio sets was not yet on a par with that earned on gramophones. This was due to several causes, one of which was the high cost of manufacture, and they believed that their long experience in the manufacture of gramophones in large quantities at minimum costs would enable them soon to reach a similar state of profitable efficiency in radio manufacture.

Cables and Wireless, Ltd.

We have received an announcement signed by Mr. J. C. Denison-Pender (governor and managing director) and Mr. F. G. Kellaway (deputy-governor and managing director) to the effect that it has been decided, with a view to reducing expenditure, that the number of directors of Cables & Wireless, Ltd., Imperial and International Communications, Ltd., Marconi's Wireless Telegraph Co., Ltd., and the other subsidiary companies shall be reduced from 22 to 14. It has been further decided that the emoluments of the directors shall be reduced. It is proposed that the retiring directors shall receive one year's fees in compensation for loss of office. The fourteen remaining directors are as follows:—Mr. F. R. S. Balfour, Sir Charles C. Barrie, Sir Basil P. Blackett, Col. the Hon. A. G. Brodrick, Mr. J. C. Denison-Pender, Admiral H. W. Grant, Mr. H. C. Hambro, the Earl of Inchcape, Lord Inverforth, Mr. F. G. Kellaway, the Marchese Marconi, the Earl of Midleton, Mr. George Peel, and Mr. L. G. Sherlock. The changes will take effect as from January 1st next, and will bring about an annual saving of £35,000.

Perak River Hydro-Electric Power Co.

In a circular letter to shareholders, the company states that depression in the tin mining industry, in addition to seriously delaying the growth of its business, has reduced the load already obtained and affected the receipts from the sale of power. The maximum load on the stations declined from 10,610 kW in December, 1929, to 8,855 kW in August last, but rose to 10,900 kW in September. The electrical energy generated fell from 72,800,000 kWh in December, 1929, to 59,000,000 kWh in August, recovering to 66,600,000 kWh in September. As the company's revenue is still mainly dependent upon sales of power to the tin industry in the Kinta Valley, the position, having regard to the possibility of a prolongation of the slump in the metal, is causing the board serious concern. In spite of the great depression in the industry, new inquiries for power are still being received and negotiations entered into with tin mining companies for supply when better economic conditions arrive.

British Aluminium Co., Ltd.

At an extraordinary meeting to be held on November 21st, resolutions will be submitted that, as from January 1st next, the 6 per cent. dividend on the original preference shares shall become cumulative, and in the event of a winding-up the holders of such shares shall be entitled to the repayment of their capital, together with a premium of 1s. per share and all arrears of dividend. The voting rights of preference shareholders are to be as follows:—Each preference shareholder shall be entitled to one vote on a show of hands; in the event of a poll, he will be entitled to one vote for each ten shares held, or, if the dividend is in arrear, to one vote for each share. It will also be proposed that the capital of the company be increased to £2,400,000 by the creation of 900,000 6 per cent. preference shares of £1 each, ranking *pari passu* with the existing preference shares of £1 each. It is further proposed to redeem the debenture stock at £110 per cent.

Companies to be Struck Off the Register.

The undermentioned companies will be struck off the Register at the expiration of three months, unless cause is shown to the contrary:—

Alpha Electric & Oxy-Acetylene Welding Co., Ltd.
Bower Electric, Ltd.
Daynight Signs, Ltd.
Dunstable Central Motor & Electrical Co., Ltd.
Eagle Electrical Manufacturing Co., Ltd.
Sheffield Wireless Depôt, Ltd.
Telephos, Ltd.
West London Scientific Apparatus Co., Ltd.

Joseph Lucas, Ltd.

Presiding at the annual meeting on October 20th, Ald. H. J. Sayer (chairman), in the course of his speech, said that the C.A.V. and Rotax companies had both paid the same dividends as in previous years. A year ago they took over control of Powell & Hanmer, and during the year they had also acquired the business of the M.L. Magneto Syndicate from Messrs. S. Smith & Sons, and with it the lighting and starting department of that company.

Electric Furnace Co., Ltd.

The directors have decided to pay the usual interim dividend of 3½ per cent. on the preferred ordinary shares on January 1st, 1931.

Venezuela Telephone & Electrical Appliances, Co., Ltd.

According to the *Financial Times* the company announces that it intends to redeem its outstanding (£132,400) 6 per cent. first mortgage debenture bonds on April 30th next. It is also redeeming the outstanding (£12,900) 7 per cent. second debenture bonds on the same date.

Marco Refrigerators (1929), Ltd.

The first report, covering the period from January 1st, 1929, to September 30th last, shows a profit on trading of £2,694, to which is added other income of £322. After deducting expenses, &c., and £1,785 written off machinery, &c., there is a debit of £7,135. Meeting: November 13th.

Brampton Bros., Ltd.

The directors report a loss of £1,515 for the year ended August 2nd. To this is added a balance of £14,680 brought forward, and after deducting the year's loss and paying the preference dividend, £9,678 is carried forward.

Edmundsons' Electricity Corporation, Ltd.

It is reported that two issues totalling £380,000 of 5 per cent. debenture stock have recently been placed privately. These issues bring the total stock on the market up to the full authorised amount. This is £1,380,000, half the paid-up share capital.

Telephone Co. of Pernambuco, Ltd.

The report for the year ended December 31st last states that, after providing for debenture interest, there is a loss on revenue account of £3,238, to which is added a debit balance brought in of £4,331, making the debit balance to be carried forward £7,569.

South London Electric Supply Corporation, Ltd.

The *Financial News* states that the company has placed privately £300,000 of 4½ per cent. debenture stock at 92, free of stamp. The stock is redeemable at par 1965-72.

Shropshire, Worcestershire & Staffordshire Electric Power Co.

An interim dividend has been declared on the "A" ordinary shares of 4 per cent., less tax (same).

Adelaide Electric Supply Co., Ltd.

A final dividend is announced on the ordinary shares of 6 per cent., making 12 per cent., free of tax, for the year (same).

Hydro-Electric Securities Corporation.

The directors announce a quarterly dividend of 50 cents per share on the common stock.

W. T. Henley's Telegraph Works Co., Ltd.

The directors have declared an interim dividend on the ordinary shares of 1s. 6d. per share, as last year.

City of Buenos Aires Tramways Co. (1904), Ltd.

A quarterly dividend has been declared of 1s. 3d. per share, less tax.

United River Plate Telephone Co., Ltd.

An interim dividend of 3 per cent., tax free, is announced.

Cawnpore Electric Supply Corporation, Ltd.

An interim dividend is announced on the ordinary shares at the rate of 6 per cent. per annum (same).

Swiss Companies.

The *Electro-Values Company*, Basle, proposes to pay a dividend of 7 per cent. for 1929-30, as in the previous year.

The *Oerlikon Machinery Works* made a net profit of 1.96 million fr. in 1929-30, against 1.98 millions in the previous year; the dividend is maintained at 8 per cent.

The *Motor-Columbus Company for Electrical Undertakings*, Baden, reports that 1929-30 was a favourable year. The net profits increased from 8.43 million fr. to 9.93 millions, and the dividend is again 10 per cent.

French Companies.

The *Société Française Radio-Electrique* reports net profits of 3,531,000 fr. for the year ended last June, as compared with 3,459,000 fr. in the previous year. The rate of dividend is maintained at 15 fr. per share.

The *Société des Accumulateurs* (late *A. Dinin*) reports a net profit of 4,121,000 fr. for 1929-30, against 7,056,000 fr. in the preceding year: the dividend is maintained at 30 fr. per share.

German Company.

The *Rheinisch Westfaelisches Electrizitätswerk* reports a net profit of Rm.25,980,000, as compared with Rm.20,320,000 last year. According to the *Financial News* it is proposed to repeat the dividend of 10 per cent.

Stocks and Shares.

TUESDAY EVENING.

THE better tendency in the Stock Exchange markets to which attention was directed here last week, has remained in force, without, however, bringing in its train any noticeable increase in the volume of business. The feature continues to be the remarkable strength shown by British Government securities, on the assumption that Mr. Snowden contemplates an early launching of his scheme for converting the 5 per cent. War Loan into some other security less expensive to the nation as a whole. Inference assumes that the Chancellor intends to put forth every endeavour to raise the credit of the country to a basis of a 4 per cent. return, as against the 4½ per cent. at which it has lately been standing. If there is anything tangible in this expectation, it will mean, of course, that gilt-edged securities of every kind will be favourably affected, and for this reason the "money" stocks are in keen request.

New Debenture Stocks.

The Yorkshire Electric Power new debenture, of which underwriters had to take 17½ per cent., is 5 premium at 103½, a rise of 1½. Newcastle-on-Tyne 5 per cent. debenture has advanced to 6½ premium. G.E.C. new debenture at 4 premium shows a gain of 25s. Edmundsons' debenture remains at 100, that is, 6½ points above the issue price. The company has just placed £230,000 5 per cent. debenture stock, which is available in the market at 99½ free of stamp. Edmundsons' have now issued the full amount of debenture stock which is at present authorised, equivalent to half the share capital paid up. It is understood that the South London Electric Supply Corporation has placed £300,000 of its 4½ per cent. debenture stock at 92. The stock is redeemable at 100 in 1965-1972. If allowance is made for redemption at the later of the two dates, the yield on the money at the price quoted will be a shade under 5 per cent. The company is well known as one of the County of London Electric group.

Home Railway Stocks.

The continued rise in the price of gilt-edged securities finds reflection in the quotations for the newly-issued London Electric 5 per cent. debenture stocks. The scrip of the second issue —that is to say, that which carries a coupon of 10s. per cent. due on January 1st, now stands at 103¾, which is 4¼ premium. The previously-issued stock of the same kind, and with an interest payment of £1 6s. 8d. per cent. due on January 1st, costs 105, this being 7½ points above the issue price at which the stock was offered four months ago. The recent Central London 5 per cent. debenture stock can still be bought at a trifle less than the price asked for its sister stock in the London Electric Railway, although, as previously mentioned here, the difference in the security of the two stocks is very slight. Metropolitan consolidated stock is 10s. better at 71½, and a rise of a point in Central London assented ordinary has taken the price to 79, at which the return on the money is £5 1s. 3d. per cent., without taking into account the accrued dividend. City & South London 4 per cent. debenture is 2 higher at 80¼ ex dividend.

Home Electricity Supply.

The £10,000 West Midlands Joint Electricity 5 per cent. stock, which was on offer at 102, as mentioned here last week, was promptly taken. Of the Central Electricity 5 per cent. 1950-1970 stock, there is £5,000 available at 103¼, free of stamp and fee. The return on the money is £4 17s. per cent.; taking redemption into account, the return is 1s. per cent. less. Interest payments are due on March 1st and September 1st. The share market is very steady, and all the improvements secured last week have been retained. Newcastle ordinary put on 9d. and the 7 per cent. preference are 1s. up at 23s. 9d. and 27s. 6d., respectively. Egham & Staines at 30s. are 1s. better. Electrical Distribution of Yorkshire shares are again firmer at 36s. 3d. Northampton ordinary at 44s. 9d. are slightly higher. The Shropshire, Worcestershire & Staffordshire Power Company has declared an interim dividend of 4 per cent. on its "A" ordinary shares, this being at the same rate as that of a year ago. The 6 per cent. preference shares stand at 23s. 6d., and the 5½ per cent. redeemable debenture stock at 104. The "A" ordinary shares last changed hands at 29s. 3d. The bulk of the ordinary shares are held by the Greater London and Counties Trust. In the London group of ordinary shares there are no changes to be noticed.

Cables & Wireless.

After giving way to some extent, the prices of Cables and Wireless stocks turned round and went ahead, the 5½ per cent. preference stock being in particular demand, and gaining 3 points at 74¼. The two junior stocks show no net alteration. Disappointing as was the character of the traffic figures published last month, September is deemed to be probably the last of the poor months through which the company has been passing. It is thought that, with business stirring in various directions, the company stands a fair chance of doing better. The dividend on the 5½ per cent. preference stock due next March is considered to be tolerably well assured, and with the appetite which prevails nowadays for investment stocks of all kinds, this semi-speculative security has attracted attention. It is obvious, however, that receipts must follow the course of

trade throughout the world. American Telephone & Telegraph is 5 lower at 200, and International Telephones at 30 show a 2½ points decline. Marconi Marines are firm at 36s. 3d. The Venezuela Telephone & Electrical Appliances Company is about to redeem its outstanding £132,400 6 per cent. first mortgage and £12,900 7 per cent. second debenture bonds on April 30th next.

Australia and India.

Although the position may change at any moment, little has occurred during the past week to lighten the uneasiness felt in regard to Australia, an uneasiness that was emphasised by the result of the recent New South Wales elections. The Government stocks continue to fall, and the mind of the investor is seriously disturbed by the continuation of this flatness. Shares in the industrial companies keep tolerably steady. The Adelaide Electric Supply Company has declared a 6 per cent. dividend on the ordinary shares, making 12 per cent. tax free. This is the same rate as that of a year ago. The ordinary shares are not quoted, but the company's 6 per cent. preference stock stands at 100, the 5 per cent. tax free preferred stock at the same price, and the 6½ per cent. preference at a couple of points higher. Of the Indian companies, the Cawnpore Electric Supply announces an interim dividend of 6 per cent. on the ordinary shares, the price of which is 28s. 6d. The difficulties in regard to Australian business are increased enormously by the operation of the rate of exchange. It costs, nowadays, about 9 per cent. to transmit £100 from Australia to this side, and moreover, a heavy restriction is placed upon the export of capital from Australia.

Dollar Stocks and Shares.

Hydro-Electric shares, after being down to 28, recovered to 29. The company has declared its usual quarterly dividend of 50 cents. The prices of dollar stocks have now arrived at levels that offer comparatively little scope for further falls, owing to the low figures to which they have descended. Brazilian Tractions are 1½ points down at 26½. Other Brazilian issues are inclined to move upwards, and the good-class bonds are in some request by investors not averse from taking a mild measure of risk in order to obtain better yields than can be derived from stocks which stand within the gilt-edged circle. Of the common shares in the utility group, Pennsylvania Water at 68½ are a point to the good. The movements in these shares, erratic as they frequently are, may be regarded as little more than pointers to the general trend, in view of the fact that Power Corporation shares have not changed hands in the Stock Exchange for official record since the first week of the present year. Power Corporation of Canada went back to 55, and Shawinigan Water at 54 show a fall of 1½.

The Anglo-Argentine Tramways group remains flat, and hope of the usual payment of the half-yearly dividend on the second preference shares, due to be made next January, is extremely thin. The company's 4½ per cent. debenture stock is lower at 67½. Amongst Mexicans, the principal change is a fall of 5 points in Mexican Light & Power common shares. Mexico Tramways stand at about 12.

Miscellaneous.

Ferranti preference have hardened to 20s. 9d., showing a gain of 6d. on the week. Henley's, after their advance to 6½, lost the fraction. The company has declared its usual interim dividend of 1s. 6d. per share, less tax. Telegraph Construction shares are weak at 17½, and business has been marked in the shares as low as 16½. This is an indirect reflection of the fall in Cables & Wireless stocks. The shares, as previously observed, are of the unusual denomination of £12 each, which in itself does not tend to make the shares popular with the ordinary investor. The present price is practically the lowest of the year. A few months ago it was up to 27½. Callender's ordinary are a trifle easier at 3½. British Aluminium ordinary have failed to recover last week's fall to 35s., which was due to a rumour, since confirmed, that the company is on the point of issuing more capital. The directors propose to create 900,000 additional preference shares, and to increase the borrowing powers. Powers are to be sought, at the forthcoming meeting on November 21st, to redeem at 110 the £507,215 debenture stock outstanding.

Philips' Incandescent Lamp Works ordinary shares have fallen to 2 1/16, on the expectation that the dividend will be reduced. The company's chairman, at the meeting held at Amsterdam on Monday in this week, anticipated a reduction of profit for the current year. He stated that the factories were working at full capacity, and in double shifts, but that the margin of profit on the improved wireless sets was smaller. Neither he nor any other large shareholder on the board, said the chairman, had sold a single share. G.E.C. 6½ per cent. preference have risen to 25s. 3d., and the 7 per cent. preference to 27s. The ordinary retain their rise at 46s. 3d. Crompton second preference are a shade harder at 20s. 3d. On the other hand, India-Rubber shares weakened to 7s., and British Electric Transformer preference to 7s. 6d. The rubber market remains in a parlous condition. The raw product has gone back to 4 1/16d. per lb. Iron and steel shares show a better tendency; Vickers, for instance, rising to 8s. A small improvement occurred in Babcock & Wilcox, the shares at 53s. being 6d. better on the week.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Approx. Dividend. 1928.	1929.	Price Nov. 4 1930.	Rise or fall	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	27/6	—	5 4 4
Brompton Ordinary	1	8½	8½	26/6	—	5 5 8
Charing Cross Ordinary	1	8½	8½	28/-	—	5 0 0
do. do. 4½% Pref. ...	1	4½	4½	18/-	—	5 0 0
Chelsea	1	8½	8½	27/-	—	5 3 9
City of London	1	10	10	33/9	—	4 8 1
do. do. 6% Pref.... ...	1	6	6	29/6	—	5 2 2
Clyde Valley	1	8	8	27/-	—	4 6 6
County of London	1	7	10	41/-	—	4 5 1
do. do. 6% Pref.... ...	1	6	6	24/6	+6d.	4 19 6
Edmundson's 7% Pref.	1	7	7	25/-	—	5 12 0
Elec. Supply Corporation	1	11	11	47/-	—	4 13 7
Kensington Ordinary	1	8	8	27/6	—	5 1 10
Lancs. Light and Power	1	7½	7	24/6	—	5 14 3
London Electric	1	8½	9	30/6	—	4 11 10
Metropolitan	1	9	10	2⅛	—	4 16 10
do. 4½% Pref.	1	4½	4½	17/-	—	5 6 0
Midland Counties	1	6½	7	23/-	—	5 0 0
Mid. Elec. Power	1	15	8	30/9	—	5 4 1
Newcastle-on-Tyne Ordinary ...	1	6	6	23/9	+9d.	5 1 0
do. 7% Pref.	1	7	7	27/6	+1/-	5 1 10
Notting Hill 6% Pref.	10	6	6	10½	—	5 11 4
North Met. Elec. 6% Pref.... ...	1	6	6	23/6	—	5 2 2
St. James' and Pall Mall	1	8	8	28/-	—	5 0 0
Scottish Power	1	8	8	29/6	+6d.	5 8 4
South London	1	8½	8½	27/-	—	5 8 8
Urban Ordinary	1	7	7	29/6	—	4 15 0
Westminster Ordinary	1	8½	8½	23/-	—	6 0 0
Whitehall Elec. Invst. 7½% Pref....	1	7½	7½	25/-	+6d.	6 0 0
Yorkshire Elec.	1	8	8	32/-	—	5 0 0

Home Rails.

Central London Ord. Assented ...	Stock	4	4	79	+1	5 1 3
Metropolitan	.	3½	4	71½	+½	5 10 8
do. District	,,	4	5	75½	—	6 12 5
Underground Electric	£1	7	8	24/-	—	6 13 4
do. do. Income ...	Bonds	6	6	104	—	5 15 5

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	102	—	5 17 8
do. Def.	...	1½	1½	25½	—	6 0 0
Automatic Telephone	1	10	12½	88/9	—	7 8 4
Cables & Wireless 5½ Pref.... ...	Stock	—	5½	74½	+3	7 7 8
do. A 7½ Ord.	...	—	—	25½	—	... ...
do. B Ord.	,,	—	—	14	—	... ...
Globe Tel. and T. Ord.	10	10	10	14½	-½	*7 0 4
do. do. Pref.	10	6	6	10½	—	5 11 7
Great Northern Tel.	10	20	20	30	—	6 13 4
Marconi-Marine	1	12½	15	33/3	—	8 11 6
Oriental Telephone Ord.	1	12	12	2⅝	—	*5 1 1

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	1⅞	—	14 13 4
do. do. 2nd Pref. ...	5	6	6	1⅝	—	17 3 0
do. do. 5% Deb. ...	Stock	5	5	52½	—	9 10 6
British Electric Traction Def. Ord.	,,	5	5	1925	—	... ...
do. do. Pref. Ord.	,,	8	8	139½	—	6 6 6
Brazil Traction	100	7	8	26½	-1½	... ...
Brit. Columbia Elec. Rly. Pce. ...	Stock	5	5	93½	—	5 8 1
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	11/-	—	... ...
London United Tram Deb. ...	Stock	4	4	82½	-5	7 12 4
Mexico Trams, 5% Bonds	—	5	5	57	—	8 15 6
Mexican Light Common	100	Nil	Nil	52½	-5	... ...
do. 7% Pref.	100	7	7	75½	—	9 5 8
do. 1st Bonds	—	5	5	78	—	6 6 7
Victoria Falls Ord.	1	15	15	58/9	+9d.	5 2 0
Yorkshire (West Riding		Nil	Nil	5/-	—	... ...

Manufacturing Companies.

Assoc. Elec. Ord.	1	6	6	23/6	—	5 2 2
Babcock & Wilcox	1	12	15	53/-	+6d.	*5 13 3
British Aluminium Ord.	1	10	10	35/-	—	5 14 3
British Insulated Ord.	1	15	15	8 7/16	—	4 7 3
Brush Ord.	Stock	10	10	105	—	9 10 6
Callenders	1	15	15	8½	-1/16	4 12 4
do. 6½% Pref.	...	6½	6½	25/-	—	5 4 0
Crompton Parkinson Ord.	5/-	—	20	20/-	—	7 10 0
do. 8% Pref.	1	8	8	26/3	—	6 2 0
Edison-Swan 1st. Pref.	1	7½	7½	22/9	—	6 6 4
do. 5% Deb.	Stock	5	5	84½	—	5 18 4
Electric Construction	1	5½	5	12/-	—	8 6 8
Enfield Cable Ord.	1	20	25	4½	—	5 17 9
English Electric	1	Nil	Nil	11/8	—	... ..
do. do. Pref.	1	8	Nil	10/-	—	... ...
Ferranti Pref.	1	7	7	20/9	+6d.	6 15 0
Gen. Elec. Pref.	1	6½	6½	25/3	+6d.	5 3 0
do. Ord.	1	10	14	46/3	—	6 1 4
Henley	1	25	20	6	-¼	5 0 0
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	7/-	-6d.	... ...
Johnson & Phillips	1	10	10	1⅝	—	5 6 8
Siemens Ord.	1	7½	7½	1 7/16	—	7 1 9
Telegraph Construction	12	10	10	17½	-1½	*6 17 0

* Dividends paid free of Income Tax.

India as an Electrical Market.

The Importance of the Stores Department; Larger Electrical Imports; Hydro-electric Activities.

IN a survey of the Indian economic situation just published by the Department of Overseas Trade,* Mr. T. M. Ainscough, Senior Trade Commissioner in India and Ceylon, shows that the unsatisfactory state of the world's affairs had its effect upon the trade of the country. This effect, however, was not so severe as it might have been for in 1929-30 exports fell by only 6 per cent. and imports by 5 per cent., and the balance of trade was still in India's favour to the extent of 79 crores of rupees (against 86½ crores in 1928-29). The United Kingdom provided 43 per cent. of the imports, as compared with 45 per cent. in 1928-29 and 63 per cent. before the war (average), and took 22 per cent. of India's exports, as against 21 per cent. in 1928-29 and 25 per cent. before the war. Japan has made the greatest advance in trade with India, the United States' trade has practically doubled, while Germany's has remained at about the pre-war level. The import trade is likely to be influenced considerably by the revised purchasing rules of the Indian Stores Department, to which we have made reference from time to time. These rules came into force at the beginning of this year so far as the departments and officers of the Central Government and of the Provinces were concerned, other than the Governors' Provinces. Generally speaking, these rules give first preference to Indian-made articles embodying Indian raw materials, then to Indian-made articles of imported materials, thirdly, to foreign manufactures held in stock in India, and, fourthly, to foreign articles which need to be specially imported. The rules also require that, with certain exceptions, articles purchased for the public service shall be delivered in India for payment in rupees in India. Important plant, machinery, and iron and steel work is to be obtained only from firms approved by the Chief Controller of Stores, who will issue periodical lists of these firms.

The Indian Stores Department.

This Department was established in 1922 for the purpose of purchasing various classes of stores required for the public service. Its services have since been used in an increasing degree by Government Departments, railway companies, Indian States, and quasi-public bodies, but recourse to the Department has been entirely optional. As a result of a recommendation by the Public Accounts Committee, however, a number of Government Departments have been instructed to utilise the Stores Department's services, and, in the case of the Posts and Telegraphs Department orders valued at Rs. 38,68,000, Rs. 28,65,000 in excess of the value of those of the preceding year, were placed through the Stores Department. Altogether, in spite of the downward trend of prices, during 1929-30 the Purchase Branch of the Department entered into contracts valued at Rs. 4,29,26,000, as compared with Rs. 3,60,48,000 in 1928-29. In pursuance of the new purchasing rules the Department obtained during 1929-30 considerable quantities of supplies manufactured wholly or partly in India. Among these were the following:—Copper wire Rs. 10,86,000, cables and wire Rs. 2,90,000, porcelain insulators Rs. 1,00,000, and electric fans Rs. 32,000. It is noted that owing to the lead given by the Department in purchasing Indian-made electric fans, spares, and electrical fittings, supplies of these articles are now being accepted by various using departments. A list is given of the more important purchases made by the Department during the year, and this includes the following items:—Electric lamps, fans, and fittings Rs. 15,69,000, bare copper wire Rs. 12,19,000, electric generating sets, steam and oil driven, and converting plant Rs. 4,01,000, electrical distribution material Rs. 2,39,000, porcelain insulators Rs. 1,03,000, radio apparatus Rs. 95,000, electric meters Rs. 62,000, and elements for primary cells Rs. 58,000. The lists of approved contractors contain the names of 272 suppliers of electrical equipment and five suppliers of wireless stores.

Increased Electrical Imports.

The imports into India of electrical machinery, including transformers and control and switchgear, during 1929-30, at Rs. 241 lakhs, represented an increase of 4 lakhs, but the United Kingdom's share declined from 185 lakhs to 183 lakhs. The amount provided by the United States also decreased—from 26 lakhs to 20 lakhs. On the other hand, Germany's share rose from 13 lakhs to 16 lakhs. The report says that this valuable trade is bound to expand during the next few years owing to the large contracts which will be placed in connection with the power schemes, hydro-electric and otherwise, in the Punjab, Madras, and elsewhere.

Considerable detail is given of the imports of electrical apparatus which rose in total value from 313 lakhs in 1928-29 to 361 lakhs in 1929-30. By far the most important item in the list is electric wires and cables (115 lakhs, against 99 lakhs), while electric lamps and parts (65 lakhs, against 49 lakhs) take second place. The United Kingdom (97¼ lakhs), Germany (5¾ lakhs), and Holland (3½ lakhs) all increased their shares in the imports of electric cables, but the United States (2¼ lakhs) experienced a decline. As regarded electric fans the United Kingdom lost ground to Italy. Germany provided the bulk of the flashlights imported, the United Kingdom's share being a very small one. Holland was the principal supplier of automobile and standard lamps, and the United States secured over half of the electric battery trade. Of the telegraph and telephone instruments and apparatus, valued at 5½ lakhs, the United Kingdom provided 4¾ lakhs, and this country also supplied the bulk of the accumulators (18 lakhs out of 26 lakhs), electric lighting accessories and fittings, including switches (10¼ lakhs out of 16½ lakhs), meters (7 lakhs out of 9¼ lakhs), and switchboards (practically the whole of 3 lakhs). About half of the electro-medical apparatus, including X-ray equipment (4 lakhs) came from the United States, the United Kingdom's share being 1 lakh. A table showing the origin of the total imports of electrical apparatus is reproduced below:—

	1928-29. Rs. (lakhs).	1929-30. Rs. (lakhs).
From United Kingdom	199	2'5
,, Germany	30	43
,, Netherlands	15	16
,, Italy	12	14
,, Japan	6	10
,, United States	39	47
,, Other countries	12	16
Totals	313	361

In addition to the above, radio apparatus valued at 8 lakhs was imported during 1929-30 (against 15 lakhs). Half of this came from the United Kingdom, Holland provided 2 lakhs' worth, and Germany and the United States 1 lakh worth each.

Hydro-Electric Development.

Progress upon the Uhl River hydro-electric scheme in the Punjab has been continuous throughout the year, and contracts have now been placed (mainly in the United Kingdom) for most of the plant and machinery, including the pipe line, power station plant and the transmission system.

Some notes on hydro-electric developments in Madras are contributed to the report by Mr. H. G. Howard, chief engineer in charge of hydro-electric development to the Madras Government. The Glen Morgan scheme, which was sanctioned in 1928, was put into operation in November last year. It has two 500-h.p. turbines supplied by Boving & Co., and a third set of similar size is being erected. The pipe line (1,800 ft. of 21 ft. diameter) is Polish. The British Thomson-Houston Co. (India), Ltd., supplied the alternators, transformers and switchgear, and also erected the pipe line and power station plant. The transmission line materials were obtained from various British firms. The plant was designed to provide power for the main Pykara scheme. The latter scheme aims at developing 21,000 h.p. on the Pykara River at a cost of Rs. 126.4 lakhs. Construction work has been commenced; the civil works are being undertaken by the Department, but the electrical and mechanical parts of the schemes are to be executed through the Power Securities Corporation, London. The specifications for the plant and equipment were sent to the Corporation early this year; tenders have already been called for, and it was expected that the award of contracts for all the plant would be completed by August last. It is expected that the project will be finished by the end of 1932. The plant will include two 9,200-ft. lengths of penstock pipes (21 to 27 in. diameter), three 6,250-kW turbo-generators, three 7,810-kVA transformers and about a hundred route miles of transmission lines. There will be sub-stations at Coimbatore, Tiruppur, Pollachi, Anamalais and Mettupalayam. Concurrently with the construction of the scheme, arrangements are being made to organise the distribution of power. Government power will be sold in bulk to licensees for distribution in the principal areas and there is expected to be considerable demand for plant in the electrification of towns, mills, and industries. A small scheme, estimated to cost 5½ lakhs, has been sanctioned for the electrification of the towns of Salem and Erode. The power will be obtained from the Mysore Government and distributed by local licensees. Tenders have been called for about 68 miles of 22 kV line which the scheme requires. Schemes for developments at

* "Report on the Conditions and Prospects of British Trade in India." Stationery Office, 3s. 6d. net.

Papanasam and Periyar have been investigated and reported upon. The former, if carried out, would have an initial capacity of 20,000 kW. There is no existing demand, but there are possibilities for the establishment of industries in the district. Investigations and hydrometric studies are also being conducted at Kolab, Palnis, Mettur Dam, and the Godavari Canals to assess their value as suitable power sites.

In dealing with the progress made with the Cauvery-Mettur project, which is designed to irrigate an area of 301,000 acres of rice crop, the report says that four rows of 8¼-ft. diameter pipes have been ordered for a potential power scheme and will be built into the dam. The diameter of these pipes has been fixed so that power units may be installed of a size suitable to tie in with the Pykara hydro-electric scheme. When a market is available a minimum power of 15,000 h.p. can be generated all the year round.

Electrical Activity in Ceylon.

The Director of Electrical Undertakings to the Government of Ceylon has provided information upon developments during the past year. He says that the Kolonnawa power station was put into full commission early in 1929 and the load was partly transferred from the old Pettah station. Twelve new static sub-stations were erected, and the 3-phase, 4-wire, 400/230-V distribution from these stations made considerable progress, overhead lines being employed. Consumers in Colombo are being changed over as rapidly as possible to the system mentioned from the old single-phase 100-V system. The 440/220-V 3-wire d.c. supply is being confined to the Fort area. The lighting of small towns in Ceylon has received special attention and at the end of 1928 21 schemes were in operation. A further 29 schemes are at various stages of consideration or development. Every effort is being made to popularise the use of electricity in Colombo and other parts of Ceylon, and e.h.p. lines are being erected from Colombo to supply small towns, mills, &c., within a radius of 20-30 miles from the Kolonnawa station, which will shortly be extended to meet the growing demand for electric power. New sub-stations are being erected in Colombo and the outlying townships, and there is every prospect of the rapid growth of electricity supply for all purposes

Revised estimates for the hydro-electric scheme were prepared during the year, and have been submitted for the consideration of the Legislative Council.

Radio-telephony and Telegraphy.

The business of the Indian Broadcasting Co., Ltd., was taken over by the Government of India from March 31st last against a cash payment of Rs. 3 lakhs. It is, for the time being, administered by the Department of Posts and Telegraphs, the Postmaster-General, Bombay, and the electrical engineer-in chief of the Telegraph Department, Calcutta, being in charge of their respective stations with station directors to advise them. In June last a Central Broadcasting Advisory Committee was appointed by the Government. Broadcasting is now proceeding from both the Bombay and Calcutta stations.

The beam system, inaugurated in 1927, continued to deal with increased traffic. The Indian Radio-Telegraph Co., Ltd., which operates the system, is negotiating with the Indian Government with a view to obtaining facilities for the more rapid distribution of traffic over inland lines. The extension of the system to other countries is being followed up actively, and negotiations are proceeding for the obtaining of a licence from the Government to operate a beam service with Japan. In addition to the development of new beam services the policy of the company includes inter-Continental telephony, and negotiations are proceeding with the Indian Government and the British Post Office for the commencement of tests in radio-telephony between Great Britain and India.

Other Electrical Matters.

In the section of the report dealing with railways it is stated that, although the programme of new construction has been curtailed after five years of considerable activity, works of improvement are proceeding. The programme for 1930-31 provides for the completion of the electrification of the Great Indian Peninsula Railway between Bombay and Poona, and Bombay and Igatpuri.

In 1928 the Tariff Board considered representations from the Indian Cable Co., Ltd., to the effect that the duty on finished wires and cables was lower than the duty on the materials which had to be imported for their manufacture, thus hampering the development of the business. As a result the Board recommended that the duty on electrolytic copper rod ("black rod") should be removed, and that a duty of 5 per cent. should be levied on rubber-insulated electric wires and cables other than those specified in Article 90A.† The Indian Tariff (Amendment) Act, 1929, imposed the suggested 5 per cent. duty, but the Government thought that there were practical difficulties in the way of removing the duty on electrolytic copper rod. It was decided, however, that the Indian Cable Co., Ltd., should be allowed to import its requirements of electrolytic copper rod free of duty.

† Article 90A includes "bare or insulated copper wires and cables any one core of which has a sectional area less than one-eightieth of a square inch, and wires and cables of other metals of not more than equivalent conductivity." These are subject to a 15 per cent. *ad valorem* duty.

Electrical Imports of New Zealand.

The Figures for 1928 and 1929 Compared.

THE following table shows the values of electrical and allied goods imported into New Zealand in 1929, according to the recently-issued official trade returns. The figures for 1928 have been given for purposes of comparison, and notes of increases or decreases added :—

	1928. Thous. £	1929. Thous. £	Inc. or dec. Thous. £
Electric batteries and cells—			
Total	162	168	+ 6
From United Kingdom	44	42	− 2
,, United States	65	70	+ 5
,, Canada	48	51	+ 3
Generators, motors and transformers—			
Total	486	423	− 63
From United Kingdom	327	272	− 55
,, United States	94	99	+ 5
,, Sweden	23	20	− 3
,, Canada	12	9	− 3
,, Germany	12	10	− 2
Insulated cable and wire—			
Total	375	366	− 9
From United Kingdom	346	341	− 5
,, United States	4	5	+ 1
,, Canada	5	8	+ 3
Electric lamps (incandescent filament)—			
Total	176	169	− 7
From United Kingdom	117	118	+ 1
,, Netherlands	35	23	− 12
,, United States	17	18	+ 1
,, Austria	3	5	+ 2
Other electric lamps—			
Total	22	29	+ 7
From United Kingdom	4	6	+ 2
,, United States	12	15	+ 3
Cooking appliances—			
Total	*	70	—
From Canada	*	63	—
,, United Kingdom	*	7	—
Carbons in blocks, &c.—			
Total	19	25	+ 6
From United Kingdom	13	17	+ 4
,, United States	5	4	− 1
Insulators—			
Total	20	14	− 6
From United Kingdom	15	10	− 5
,, United States	3	3	—
Wireless sets in cabinets—			
Total	34	86	+ 52
From United Kingdom	3	4	+ 1
,, Canada	3	6	+ 3
,, Australia	3	2	− 1
,, United States	25	70	+ 45
Telegraph and telephone material—			
Total	304	305	+ 1
From United Kingdom	63	89	+ 26
,, Canada	1	3	+ 2
,, United States	73	130	+ 57
,, Belgium	138	54	− 84
,, Netherlands	15	14	− 1
Other electrical material—			
Total	504	358	−146
From United Kingdom	294	200	− 94
,, United States	87	81	− 6
,, Australia	20	23	+ 3
,, Canada	74	19	− 55
,, Switzerland	10	44	+ 34
,, Sweden	3	14	+ 11
Electricity meters—			
Total	50	77	+ 27
From United Kingdom	38	47	+ 9
,, Canada	10	26	+ 16
,, United States	1	2	+ 1
Recording and testing instruments and meters—			
Total	77	76	− 1
From United Kingdom	47	46	− 1
,, United States	22	23	+ 1
,, Germany	3	3	—
Vacuum cleaners—			
Total	67	68	+ 1
From Canada	25	26	+ 1
,, United Kingdom	5	7	+ 2
,, United States	15	11	− 4
,, Sweden	18	19	+ 1

* Not specified.

A New Frequency Meter.

A Description of a New Deflectional-type Instrument for the Measurement of Power Frequencies.

By C. L. LIPMAN, A.M.I.E.E.

TO meet the ever-growing demand for pointer-type frequency meters, a new deflectional-type instrument has been patented by Messrs. Nalder Bros. & Thompson, Ltd., and the author which possesses many advantages over earlier designs. It is generally realised that the design of a frequency-measuring instrument, whose readings will be independent of voltage, temperature, and other disturbing influences, is a difficult problem, and there is, therefore, no wonder that so many ideas, some of which appeared ingenious in theory, have failed in practice. The new instrument meets the strictest specification as regards accuracy, and in addition possesses novel features which have largely contributed towards its practical success.

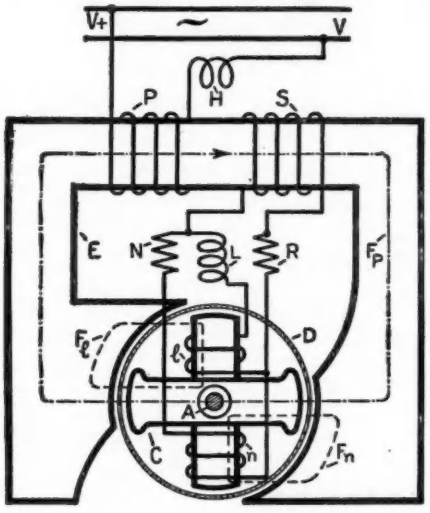


Fig. 1.—Diagrammatic Arrangement of New Frequency Meter.

The new frequency meter works on the induction principle, and consists essentially of two parts—a fixed and a moving system. The fixed system embodies an external U-shaped electro-magnet, E in fig. 1, carrying the primary and secondary windings P and S, respectively, and an internal core C of cruciform shape on two diametrically opposite polar projections on which are mounted two auxiliary coils *l* and *n*. The moving system consists of a thin aluminium drum D which is free to rotate in the air-gap between the poles of the external and internal electro-magnets E and C, respectively. The spindle A, to which the rotor is attached, rotates between jewelled centres and carries also the pointer and balance weight arms in the usual manner. The whole movement is very light, weighing about seven grams. The size of the complete element is such that it can be mounted in a 6-in. or 8-in. diameter case, or in the sector-type case of standard dimensions.

The electric and magnetic circuits are diagrammatically illustrated in fig. 1.

V+ and V are the terminals of the main winding P, L and H are suitable choking coils, N and R are suitable non-inductive resistances, S is the secondary coil, and *l* and *n* are auxiliary windings.

The primary coil P is energised directly or through a suitable potential transformer from the supply, the frequency of which it is desired to measure, and produces the main flux *Fp* of the instrument, which acts upon the rotor D in a horizontal direction. The auxiliary coils *l* and *n* are energised in parallel from the secondary coils, and produce fluxes *Fl* and *Fn* which act upon the drum D in a vertical direction, *i.e.*, at 90 geometrical degrees to the direction of action of the main flux *Fp*. The coils *l* and *n* are wound so as to produce, in combination with the main flux, shifting fields in opposite directions, which are adjusted to be of equal strength at the normal frequency, thus balancing one another and holding the moving member in a given—for example, a central—position. In the circuit of the coil *l* is inserted an inductance L, and in the circuit of the coil *n* is a non-inductive resistance N. An inductance H in the circuit of the primary P filters out any higher harmonics present in the applied-voltage wave. A change of frequency alters the relative values, and to a certain extent the phase relations of the currents in the parallel secondary circuits; thus if the frequency rises above the normal, the current in the coil *l* in series with the inductance L will decrease, the current in the coil *n* in series with the non-inductive resistance N will increase (due to the special transformer construction), and the drum D, under the action of the out-of-balance torque, will take up a new position of equilibrium. The response is quick and certain, and hence the pointer indicates the instantaneous value of the frequency of the alternating current system to which the instrument is connected.

A feature of the new frequency meter is that in order to obtain stable readings without the use of a control spring the rotor is shaped as shown in fig. 3, which represents a development of the drum D. It will also be noted that the poles of the electro-magnet E are so arranged that the magnetic fluxes *Fl* and *Fn*, due to the auxiliary windings *l* and *n*, respectively, traverse diagonally opposite parts of the polar surfaces of the electro-magnet in local paths (indicated by dotted lines in fig. 1), which interact with the main energising flux *Fp*, but do not mutually intersect, and produce fields tending to rotate the moving system of the instrument in opposite directions. This feature, that the main flux is common to the two fields which are rotating in opposite directions, is of great importance from the point of view of accuracy, since errors, if any, cancel out.

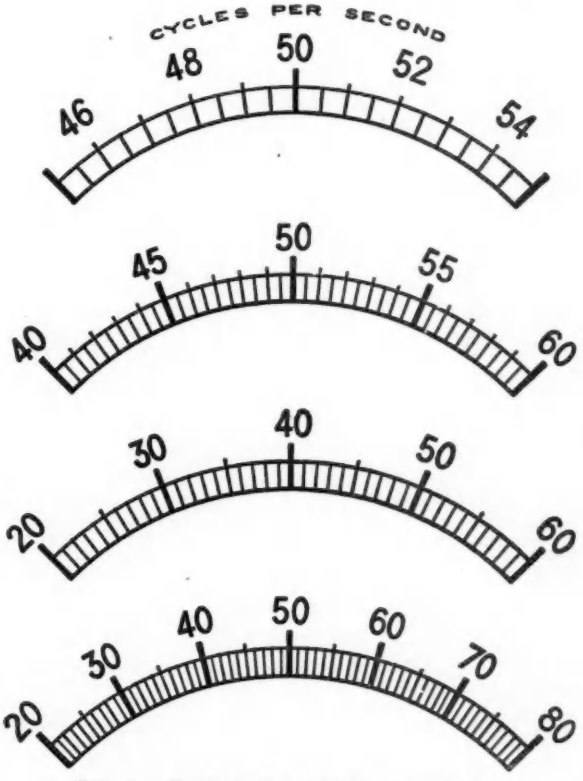


Fig. 2.—Typical Meter Scales; half size.

The above novel features render the new frequency meter independent of voltage and temperature variations over very wide limits. A further striking feature of the new instrument

is the very long and uniform scale, which extends over an angle of nearly 90 deg. The flexibility and simplicity with which any shape and length of scale can be obtained is remarkable. By a suitable choice of resistance N and inductance L for a given normal frequency, say, 50 cycles, the meter can be given a scale range of 45/55, 40/60, 20/60, or 20/80 cycles per second, according to requirements. A set of typical scale ranges (reduced to about half full size) is illustrated in fig. 2. It will be clear, therefore, that the length of scale per period can be made to be anything from 1/16 in. to over 1 in., according to the selected range of frequencies and the size of the instrument. Multi-voltage ranges can easily be provided by placing suitable multiplying impedances in series with the primary winding of the meter.

Finally, the new frequency meter embodies a very desirable

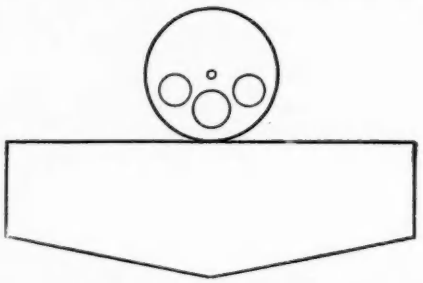


Fig. 3.—The Rotor Form, in Development.

novel feature which is of great practical importance; this may be termed a "no-volt" device, the function of which is to return the pointer to its "off scale" position when the supply to the instrument is cut off. This feature overcomes the criticism often made against deflectional-type frequency meters that the pointer remains on the scale even when the instrument is not energised.

The degree of accuracy obtainable on this type of frequency meter is very high. The slightest change in frequency is instantaneously indicated by the pointer; no moving coils are employed, and all extraneous controlling forces due to conducting ligaments or brushes are thereby entirely eliminated. No condensers are employed, hence there is constancy of calibration.

The indications of a given instrument are practically independent of variations of pressure; a change in voltage of plus or minus 30 per cent. from the normal e.m.f. at which the instrument is calibrated does not affect the readings more than by half of one per cent. The instrument is also free from errors due to variations in temperature, and it can thus be left

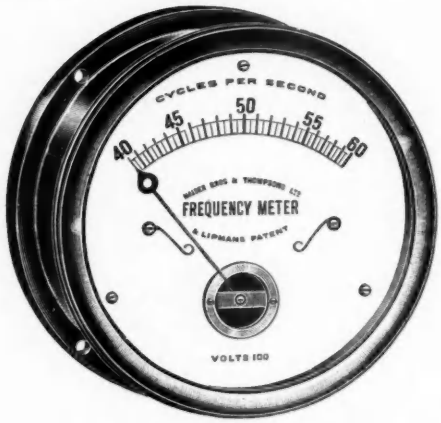


Fig. 4.—Frequency Meter with 8-in. Dial.

continuously in circuit. Within the range of wave distortion found in commercial practice there is no appreciable error. Other advantages are low volt-ampere consumption, high torque, and a light moving system which is inherently deadbeat. The primary circuit can be wound suitable for direct connection to the mains at any pressure up to 650 volts, but the standard arrangement is to work off the 110-volt secondary of an ordinary potential transformer.

The new frequency meter is self-contained, requiring no external boxes or other attachments. Fig. 4 illustrates the general appearance of an 8-in. diameter dial instrument, the length of scale of which is about six inches.

Pollution of the Atmosphere.

Extracts from the report* issued by the Department of Scientific and Industrial Research on observations made in the year ended March 31st, 1929.

THE circumstances under which the Department of Scientific and Industrial Research has now become responsible for co-ordinating local observations of atmospheric pollution, for carrying out research into the nature of pollution, and for the best methods of measurement were explained in the Fourteenth Report on Atmospheric Pollution (ELECTRICAL REVIEW, May 23rd, 1930). An Atmospheric Pollution Research Committee has been appointed to give to the Department expert scientific advice on these matters, and arrangements have been made for the setting up of a Standing Conference of Co-operating Bodies to maintain effective touch between the central organisations and the local authorities and other bodies who are assisting by making financial contributions or by maintaining observations. In addition, therefore, to the actual data collected during the year 1928-29 and the report of the Superintendent of Observations thereon, the present volume contains the report made by the Standing Conference to the Co-operating Bodies on its proceedings during that year, together with an account of the work of the Research Committee.

The arrangement of the statistical data given in the report follows the modified form adopted for the first time in the Fourteenth Report after consultation with the Permanent Consultative Committee on Official Statistics. This rearrangement necessarily caused considerable delay in the publication of that report and the present one still lags very much behind the period to which it relates. The leeway is, however, being made up, and it is hoped that the Sixteenth Report (that for the year 1929-30) will appear not much later than what will be the normal time in the case of future issues.

During the year arrangements were made for the Government chemist to undertake an investigation into the problem of measuring sulphur impurities in the air. A striking fact is that in the place of experiment (Holborn), at all events, sulphur trioxide is not a normal constituent of the atmosphere; it appears only during fog. This result is somewhat unexpected, but later work appears to confirm it. It is hoped as a result of this investigation to produce a method which will be suitable for the routine determination of the amount of sulphur in the atmosphere.

Further consideration was given to the development of a simple means of obtaining daylight records. The difficulty in dealing with the measurement of daylight or ultra-violet light is that the proportion of light in different wavelengths varies considerably on different days, and consequently a measurement of the amount in any one wavelength gives little information as to the total light or the quality of the light. Similarly, any means of measuring total light will fail to give information as to its quality. The discussions of the Committee, however, appeared to show that measurements on two different wavelengths will give fairly complete information as to both the quality and the quantity of daylight. As a result, the National Physical Laboratory were asked during the year to develop a simple apparatus for measuring the total light received during a period of 24 hours in two definite wavelengths. An experimental instrument has been designed which has been shown to provide for an intensity range ample to cover all times of the year. The next step is to make the modifications necessary to convert it into a suitable service instrument.

Further consideration was also given to the determination of water in fogs, and a request was addressed to the National Physical Laboratory to undertake investigations into the subject. Two suggested methods are being considered, namely, the Kohler method and the Owens method. In the former the fog-laden air is warmed until the moisture is all evaporated, and then the total moisture content is determined by means of a wet and dry bulb hygrometer. This method can naturally be operated as a continuous flow method, so that it takes an average of a fairly large sample of air. The method devised

* "The Investigation of Atmospheric Pollution," fifteenth Report. H.M. Stationery Office. Price 3s. 6d. net.

by Dr. Owens is designed to measure the free water alone. A sample of the fog-laden air is enclosed in one vessel, and a sample of filtered air in another, the two vessels being connected to the two limbs of a manometer. Initially, there is no pressure difference, since both vessels are filled at atmospheric pressure. Communication with the atmosphere is then cut off, and the whole apparatus immersed in a water bath. The pressure increase in the vessel containing the foggy air may be considered as made up of two parts, one due to the warming of the air itself and of the water initially present as vapour, and the other due to the evaporation of liquid particles. The former portion of the pressure increase is exactly compensated by the pressure increase in the vessel containing filtered air, so that the manometer reading depends only on the liquid initially present. In addition to these two methods it is proposed to consider the construction of an apparatus for determining the moisture content gravimetrically so as to have some standard of comparison. This investigation has been impeded by the unusual absence of fog since it was begun, and some further observations will be required before a report can be presented.

The question as to whether rain brings down atmospheric impurity has been considered in previous reports. An attempt has been made this year to examine the London deposits from this point of view. In the case of the soluble matter, there is a definite indication that it tends to vary with the rainfall, while with the insoluble matter no such tendency is observable. Since the rain which falls over a particular area is not necessarily produced by condensation in the vicinity of that area, it seems probable that we have to look to a washing effect, by which the falling drops operate selectively on the suspended matter, as a more potent cause than condensation round soluble nuclei.

No doubt the latter comes into operation also, when the conditions are suitable, as it is certain that water condensing in air containing suspended soluble and insoluble particles would tend to select the soluble matters as nuclei of condensation, more especially if the insoluble particles contained tarry matter.

In January, 1929, there was a fairly bad smoke fog in London, and the automatic filter records taken at Victoria Street for the three days of fog, January 7th, 8th, and 9th, showed that the distribution over the twenty-four hours was practically similar to days without abnormal impurity. There was the same rapid rise to a maximum in the forenoon, which was reached at 10 o'clock on the three days of fog, followed by a slight fall and a subsequent rise again in the afternoon.

The relation of domestic to industrial smoke has been examined previously in London, and from this it appeared that the smoke pollution of the city consisted of about 2½ parts of domestic smoke and 1 of industrial smoke. The relation was obviously a local one and depended upon the relative amount of domestic and industrial smoke produced in the neighbourhood.

The subject has been examined in Glasgow, during the current year, where five automatic filters are in operation.

The method adopted for comparing industrial and domestic smoke is based upon the assumption that on Sundays industrial smoke is absent, while on week-days industrial and domestic smoke are both present.

The ratio of domestic to industrial smoke on week-days for each station was shown to be: average week-days, 3.59; average Saturdays, 5.71.

On Saturdays, when factories are closed for half the day, the domestic smoke was naturally more in evidence than on other week-days. This also indicates that the method used gives some approximation to the true facts.

Illumination Progress.

Extracts from the annual report on the developments of the past twelve months prepared by the Illuminating Engineering Society.

THE opening meeting of the session is customarily devoted to reports on progress and exhibits illustrating recent developments in illuminating engineering. Last session a general report was prepared by the Papers Committee, but it was considered desirable to enlarge the circle of those responsible for the collection of information, and the preparation of the report was handed over by the Council to the newly formed Technical Committee.

Generally, there are no very radical advances to record, though in most directions there is evidence of steady progress.

Lamps.—The number produced per annum has substantially increased, and the standardisation of types has enabled the prices to be further reduced. The gasfilled type can now be used with advantage in nearly all cases, and there has been a steadily growing inclination to make use of internally-frosted or opal bulbs, so that 50 per cent. of the lamps sold for general service are now of these types. The British Standard Specifications (Nos. 33 and 161) have been revised, and a new specification, B.S.S. 377/1930, has been prepared for miners' lamps. A considerable improvement in candle-power and maintenance of candle-power for this important type of lamp is shown, and the demand for better lighting in mines has inspired experimental work in connection with the use of high-voltage lamps in the working areas. Enclosing the lamps in tough well-glasses appears to overcome the risk of explosion, and when care is taken in the installation to avoid undue breakages, this form of lighting is quite practicable.

A committee has recently studied the subject of lamps for use on aeroplanes, and a specification has been prepared giving important data. Inside colour-sprayed lamps are now being manufactured, and they should give a much better result than the old outside-sprayed lamps. The widespread interest in architectural lighting and the development of special electric signs has brought about a substantial increase in the demand for tubular lamps; larger sizes have been introduced, and they have been standardised. Sign lamp standardisation work has also been accomplished, and the introduction of the new "Pygmy" sign lamp seems to play an important part in sign lighting of the future. Very large gasfilled lamps are now being used not only for lighthouses, aerodrome beacons, and floodlighting, but for kinema studio lighting, and even for ordinary street lighting as well, while 2,000-watt lamps have been installed in St. Marylebone for street lighting, being the first of this size to be used in this country for this purpose. A marked increase has occurred in the use of electric lamps for outdoor decoration, particularly at seaside resorts; in Blackpool alone some 300,000 lamps are being employed this year.

Fittings and Accessories.—Few outstanding innovations in design have occurred, yet definite progress may be reported. The so-called "modern-art" type is finding a definite place, though the striking (but inefficient) examples introduced a year or two ago are now less in evidence. Serious attempts are being made to combine modern ideas of correct lines, efficiency, and general usefulness.

Several fittings have been introduced with two or more sets of lamps, what may be called a "main light" lamp and also a "pilot" lamp, while in other cases large-wattage lamps are used to produce indirect light in conjunction with low-wattage lamps giving direct light. Devices for concealed cornice and panel lighting have received some attention, and new designs of troughs have been produced. Floodlights have been rendered suitable for a greater variety of uses, partly by more sturdy construction so as to withstand rough usage and partly by the use of special front lenses designed to produce various types of light distribution from one setting of lamp and reflector. Two new types of spotlights rely on the use of lenses to a much greater extent than former types, and as a result a much improved control of the beam of light is obtained. The "extensive" lighting of open spaces, docks, and streets has been catered for, respectively, by the introduction of flat conical reflectors, wide-angle silvered glass reflectors, and special refractors. Among these new refractors are to be found more ornamental designs, and new designs of single piece domes of British manufacture, and also some with the reflecting segments particularly suitable for the lighting of wide roads from the pavement edge.

New industrial reflectors of the enamelled-iron and prismatic-glass types have been introduced; the former newcomer is of the built-up type which, it is claimed, has advantages over the one-piece type, so that neither method of manufacture can be said to have a clearly established supremacy.

The introduction of high-power incandescent lamps for the lighting of sound-film studios was recorded in the last annual report, but during the last twelve months the arc has to a certain extent regained the position, owing to the introduction of a full range of silent arc lamps.

The problem of gallery screws for the support of illuminating glassware is still with us, although at least three attempts have been made during the last twelve months to overcome it. In one case a split metal collar is slipped over the neck of the glassware into the screw ring, thus taking up the pressure of the screws and transmitting it more or less uniformly to the glass. In another a spun metal screw ring with a shoulder is slipped through the neck of the glassware, thus taking all pressure off the glass, except its own weight. In the third type a metal ring slips over the neck of the glassware and is held in the gallery proper by three spring clips.

Domestic Lighting.—With the progressive diminution in the cost of light there has been within the past twelve months a

growing tendency on the part of the general public to use more illumination in their homes. In the case of newly built houses, people are coming to realise the advisability of arranging for the lighting points while the house is in process of construction, instead of the time-honoured practice of treating the lighting as an "after-thought," and people are now more inclined to consider the lighting of the home as part of its decorative scheme. The advantages of two-way switching are also more extensively realised; varied designs of panel-type wall brackets, with central pendant fittings to match, have gained in popularity. The modern preference is for domestic fittings of a simple and "clean-out" type without unnecessary trappings, and there is now a keen demand for fittings with coloured glass or tinted material, the general domestic trend being towards the use of the concealed or indirect light.

Clear gasfilled lamps are rapidly being replaced by the internally-frosted ("Pearl") and opal types, especially in open shades and inverted bowl fittings, and colour-sprayed lamps are being extensively used in pendant fittings, wall brackets, and decorative ornaments.

Public Buildings and Offices.—The minimum intensity of illumination for clerical and similar work is still on the upward grade, due to (1) the higher efficiency of lighting units, and (2) improvements in design, enabling high illumination to be furnished without glare or distraction. The exact range of intensities to be adhered to has yet to be established by fundamental tests; many installations are designed on the basis of too low an intensity.

Improvement in rooms intended for single occupants usually resolves itself into a question of glassware design; in this respect there has been a marked advance, though too many of these fittings are of foreign manufacture. In offices for massed staff a combination of general and individual illumination is now not unusual.

In an interesting example of the lighting of basements the main light comes from ceiling panels glazed with colour-correcting glass, but a novel feature is the provision of false windows along the walls, each (6 ft. by 2 ft. 9 in.) double-glazed, first with daylight glass and then a colourless diffusing glass, and illuminated with twelve 40-watt lamps. A case of "mixed lighting" is the National Gallery (pictures) in Edinburgh, where naked lamps are installed round the lay lights. A blue lamp is inserted in every third holder. It is stated by the galley authorities that colour distortion has thus been reduced appreciably, and that they prefer this mixture to the more fully corrected light.

Industrial Lighting.—The annual report of the Chief Inspector of Factories and Workshops for 1929* again comments on the steady improvements in industrial lighting. An excellent summary of the advantages and fundamental principles of good illumination has been issued in a useful Welfare Pamphlet, No. 7, by the Home Office. The range of industrial lighting fittings available has been extended. Although the clear gasfilled lamp is still most commonly used in modern industrial reflectors, the use of internally-frosted ("Pearl") and opal types is increasing.

During the autumn of 1929 an extensive investigation conducted into the lighting of textile mills showed that the average lighting conditions were, in general, very poor, in spite of the visually exacting nature of the work.

Public Lighting.—Most cities have been either extending or improving their lighting. A permanent demonstration centre, where all the latest methods of public lighting could be viewed in use on roads specially set apart for the purpose, would prove of great value to local authorities. Glare is exercising the minds of public-lighting superintendents throughout the country. There has been some discussion regarding the use of mirror-reflector fittings of a highly concentrating type; it is stated that their adoption in Aberdeen has not been attended by complaints of glare. The Bradford Electricity Department is now using opal lamps exclusively for street lighting, whilst in Liverpool a recognised difficulty in connection with glare has been overcome by reconstructing existing lanterns and attaching to each an eye-screen; an opalescent screen, whilst affording equal illumination, gives a better result than a metal one. The influence of the British Standard Specification for Street Lighting is evident in a number of annual reports; in many cases new lamps are fixed at increased heights.

The mechanical control of street lighting continues to extend. Additional relays for remote control have been fitted and tests are proceeding with time-switches and photo-electric methods.

Traffic Control.—The adoption of automatic luminous signals has made further progress, and experiments are now being made in most of the chief cities. The memorandum on the design of such signals issued by the Ministry of Transport in 1929 (No. 297—Roads) has been followed this year by Recommendations for the Standardisation of Road Direction Posts, Warning Signs, and Traffic Notices (No. 291).

Automobile Headlights.—The R.A.C. and other bodies have laboured to encourage experiment, but no single device has been found to provide a foolproof means of preventing dazzle. No matter how glare is prevented on the level, lamps giving a useful driving light must cause dazzle when breasting a hill, or otherwise inclined upwards in relation to approaching drivers. It seems unlikely that any form of controllable device will satisfy any regulations that may be imposed, since a man may fit such a device without using it. Fixed anti-dazzle devices admittedly give an inferior light, yet they have been made compulsory in various forms in most of the United States of America.

Railways.—The most noteworthy development in railway lighting has been the application of floodlighting to goods yards, carriage sidings, &c. Projectors mounted from 30 to 40 ft. above rail level have been used with considerable success, and no serious complaints have been received from the staff of uncomfortable glare when working in the direct line of the floodlight. Another recent development is the extended use of special reflectors for the economical illumination of platforms, especially "directive" types. At some of the large terminal stations attempts have been made to improve the general effect by introducing fittings which allow a considerable proportion of illumination to reach the roofing.

Lighthouses.—No very marked advance has been made in apparatus for lighthouse illumination. There has, however, been steady progress in the transition from other forms of lighting to incandescent electric lamps of the 5- and 10-kW types. There is a definite tendency towards rendering lighthouses completely automatic, even where there is a resident attendant.

Aviation Lighting.—The sectional meeting of the International Commission on Illumination held in Berlin in April was attended by about 90 delegates representing the following countries: Austria, Czecho-Slovakia, Denmark, France, Germany, Great Britain, Holland, Hungary, Japan, Norway, Poland, Sweden, Switzerland, and the United States of America. It was arranged to ascertain what measures of agreement could be obtained immediately on the fundamental principles involved in the lighting of aircraft and airways, to guide the activities of the National Committees in preparing their final recommendations, which will be submitted to the plenary session of the International Commission, to be held in 1931, for ratification.

Considerable improvements have been made in the design of high-power gasfilled lamps, up to 10 kilowatts, for use in floodlights and beacons. The introduction of the thermionic kathode neon tube having an intrinsic brilliancy greatly exceeding that of any tube hitherto available may lead to new lines of development in this class of lighting.

Theatre and Stage Lighting.—On the decorative side the general tendency has been to incorporate lighting elements in the architectural scheme. In stage lighting advances have been made in remote and automatic control and pre-set devices, which give an almost endless variety of effects and colour mixing with the intervention of an operator. Amongst the chief advances in apparatus may be mentioned the use of a specially designed chromium-plated reflector and low-voltage gasfilled lamp as a subsitute for the arc lamp for long throws, and the introduction of a novel form of scenic projector of Continental design.

Illuminated Signs.—The past year has not been marked by any radical advances in this field; unsatisfactory trade conditions have materially obstructed progress in sign manufacture and design. One feature, however, has been the exceptional development of luminous tube signs, especially with regard to the technique of installation. It is now common practice to countersink the tubes into the background and to conceal the electrodes and accessories, the effect of the sign being thus much improved. It is not considered probable, however, that luminous tubes will replace lamps, and the tendency is for them to be applied in combination. Luminous tubes do not lend themselves to animated effects beyond a simple "on and off" movement, whereas one can get almost any desired effect from exposed lamps in trough metal work. The use of illuminated facias does not seem to be extending in this country as rapidly as elsewhere.

The existing laws relating to signs hinder their development. Scarcely any two towns in this country have similar regulations; owing to legislation difficulties the cost of putting up large temporary signs is frequently prohibitive.

Floodlighting.—Floodlighting has been installed on an increasing number of buildings and applied for a greater variety of purposes during the past year, including outdoor sports and coloured light.

Photometry.—Various developments have been reported during the past year and a large amount of work is still being carried out on the use of photo-electric cells, which are used for measuring the colour-temperature and lumen output of incandescent lamps, and their advantages over the visual method would appear to be very great. A direct reading photo-electric photometer for commercial measurements is capable of rapid and accurate work, while photo-chemical measurement of daylight involves the measurement of the chemical decomposition produced by the photo-electric current, and so provides a means of integrating daylight over periods of time.

Spectrophotometric application of photo-electric cells is claimed by some to indicate that the eye is very often a better instrument than photo-electric cells, though for certain portions of the spectrum they are much better than the eye; but in others, and for many problems in photometry, their chief advantage is speed.

Miscellaneous Research.—The important part played by surface brightness in interior and in street lighting is now becoming well recognised, and the field for research is a large one. Research in the production and application of ultra-violet radiation has been conducted with continued vigour during the past year.

* ELEC. REV., August 22nd, 1930, p. 316.

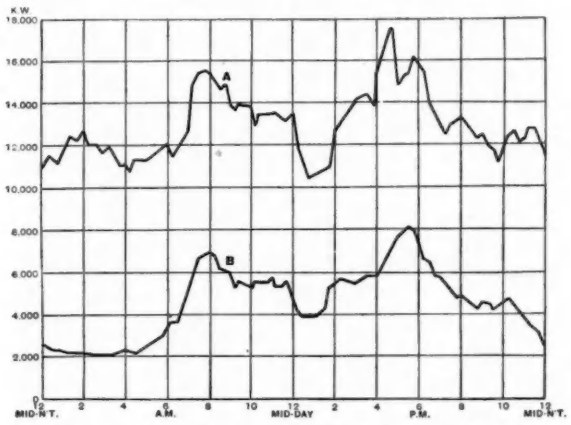
An Engineer's Outlook.

A Broad Survey of Some Phases of Our Activities—Past and Present.

By A. L. LUNN, M.I.E.E., M.I.Mech.E.

(*Extracts from chairman's address,* NORTH-WESTERN CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS, *Manchester.*)

A GREAT future lies before the electrical engineer. Dr. Herbert Levinstein, president of the Society of Chemical Industry, in an address at Birmingham on July 15th, 1930, prophesied a condition of things under which this country would be dependent almost entirely upon the chemist; but he seemed to ignore the very large part to be played by the electrical engineer, who is destined, with the help of the chemist, to take a very large share in the development of the large potential agricultural resources of this country, at present so poorly utilised. The important part the grid will play in this intensive development must not be forgotten. Faraday, the hundredth anniversary of whose invention of the electro-dynamic principle we hope to celebrate next year, was a great chemist as well as a physicist. Although the two great sciences thus closely allied in his personality subsequently diverged, they are now coming together again. Can we imagine what the world would have been like without the discovery of electricity?



Typical winter day. Curve A, 1924, daily load factor, 74.4 per cent. Curve B, 1915, daily load factor, 56.5 per cent.

Fig. 1.—System Load Curves, Basle, Switzerland.

Training.—The engineer of to-morrow will have to be far better equipped mentally than his predecessors. Many of the large engineering works have already realised this fact and set the excellent example of giving their junior staffs thorough all-round training, but the electricity supply industry has a great distance to travel in this direction.

In recent years difficulties have unquestionably been met in securing suitable men for the higher positions in the industry. While there are many specialists, an undoubted scarcity exists of men whose training and experience have given them that wide grasp of affairs which is so essential in the management of a large undertaking. Too many young men specialise at an early age. The dearth of men of the right type to-day is the result of the unorganised methods of training which existed a decade or so ago. Only proper schemes of training will enable more precise selection to be effected. Moreover, when suitable schemes are in operation employers can be sure that the employés whom they engage will be considerably above average ability. The training of engineers is of national importance, because Great Britain will only emerge triumphant if those in command of its various industrial undertakings are capable of properly organising and efficiently administering the concerns under their control.

Co-operation Keynote.—Accompanying scientific progress, new conceptions have emerged regarding methods of organisation in industry, which are clearly destined to play an important part in securing industrial efficiency.

To-day shows a new orientation. The constant compilation and publication of statistics has slowly abolished parochialism and made a national outlook possible. New standards have been created by which achievement can be measured, a spirit of healthy rivalry has been fostered, and the barriers which have hitherto stood in the way of co-operation have been broken down. The result is that electricity supply is truly becoming a national industry, with the welfare and service of the nation as its primary aim.

Industrial Electrification.—World-wide trade depression encourages pessimism, some observers even maintaining that the electricity supply industry, in the more highly-developed countries at least, is reaching its zenith. I hold that nothing can be further from the truth. An outstanding feature of our age is the growing social conscience which demands, in addition to greater material security for mankind, a higher standard of comfort and hygiene. In the realisation of that demand no agency will be more useful than electricity. Its application to industry is of supreme importance to the nation, in particular to the basic industries, which would increase their productive capacity. Government assistance should be available to carry out this process. Perhaps the most interesting economic change that the extension of electricity to all parts of the country may bring about will be the decentralisation of industry and, with it, the resuscitation of local industries; experience in Germany points to the possibility.

Transport.—The electrification of transport comes next in importance to that of industry, and represents an even greater potential demand for electricity. The completion of the national grid supply scheme is likely to reduce the cost objection by rendering unnecessary the construction of new power stations, and main-line electrification in this country will, I believe, both accelerate and cheapen transport. It could be carried out as part of a transport reorganisation scheme for the entire country, and the capital required for it could be raised under the Trade Facilities Act.

The tendency in some town to abolish tramways and substitute petrol-driven omnibuses is to be deprecated, first, on account of the enormous amount of capital sunk in tramway undertakings being at one stroke rendered unremunerative and, secondly, because petrol is for the most part a foreign product, its supply and price being vested in interests which in certain circumstances might be inimical to Britsh interests. But why should electrical engineers be content to remain supine in the matter? Trolley-'buses are used successfully to a considerable extent in several localities, but generally there is too great a tendency to abandon the electric motor altogether in favour of the internal-combustion engine. Existing power facilities, which would otherwise be rendered to a large extent derelict, with consequent serious loss of capital, would thus be effectively utilised. It has been estimated that 50 railless vehicles in full service would keep 45 coal miners constantly employed, based on coal consumption at a high-efficiency generating station. In addition, there

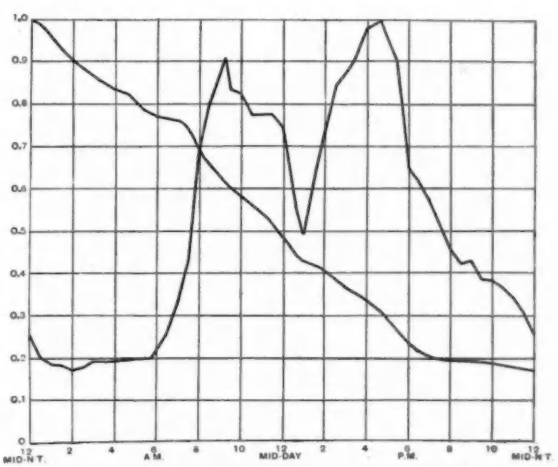


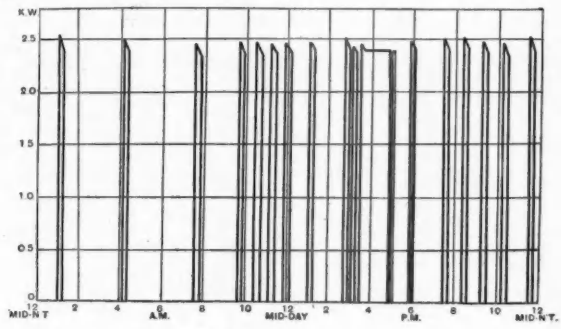
Fig. 2.—Load and Utilisation Period Curves, British System.

would be those engaged in transporting the coal, the builders of transport vehicles, railway workers, and so on, whereas petrol is practically entirely of foreign origin, and there is no point on which it can be claimed that the petrol-driven vehicle is superior to the electric trolley-'bus, running on electrically-equipped routes. The total cost of petrol and oil for one of the former is, approximately, £600 per annum; for a railless vehicle of equivalent size and type, the cost of energy is only about £370. Operating costs in the case of the latter are over 20 per cent. less, and the costs of maintenance and depreciation are considerably smaller. Whereas the period of repayment of loans for the purchase of petrol vehicles is six years, that for trolley vehicles is ten years; moreover, at the end of the six-year period the petrol vehicle would be completely worn out, while the other would still have a useful life before it.

The following figures, relating to American practice, illustrate in no uncertain manner the value of electric traction in improving the system load factor, with resulting benefit to all classes of electricity users:—

Lighting only, 23 per cent.
Lighting and city traction, 32 per cent.
Lighting and industrial uses, 40 per cent.
Lighting, industrial uses, city and inter-urban traction, 45 per cent.

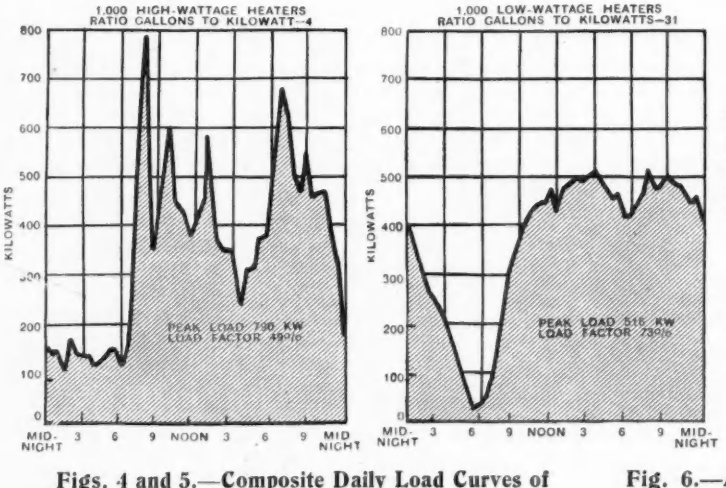
The winter monthly load factor of the city traction supply in Manchester approximates to 34 per cent. The annual consumption of the whole tramway system during 1929-1930 was 49 million kWh, or 12.7 per cent. of the total energy sold. An extension of the policy of substituting petrol-driven 'buses for tramcars would tend to reduce the overall load factor and thus reduce the benefits of inter-connection. Further, in Manchester alone, the reduction in the consumption of coal on the cessation of the electric tramway system would amount to, approximately, 55,000 tons per annum. The value of the electric-battery vehicle has not been appreciated in this country. The night-charging load is considerable and, if large numbers of those vehicles were employed, the effect upon the load factor would be important, particularly in summer months.



Rating=40 gallons, 2.5 kW, 230 V. Energy available any time.

Fig. 3.—Water Heater, Thermostatic Control.

Domestic Load.—Typical consumption data for average domestic users indicate the vast possibilities of load building by this class of consumer alone. In Manchester only 18.9 per cent. of the houses are equipped with electric wiring, a large proportion of them for lighting only (66 per cent.). In addition to the average figures contained in Table I, the consumption due to the use of miscellaneous appliances may amount to several hundred kWh, and the load is, moreover, not seasonal. The great diversity of use of miscellaneous domestic appliances and cookers results in a fairly high annual load factor for domestic loads. Principally because of this, and the extended use made of the facilities which must be provided for lighting, electrical energy for this purpose can be made available at low rates by means of a comprehensive tariff. But it has to be noted that the consumption of electricity for space heating (or air heating, as it is termed in America) is largely seasonal in character, particularly where it is used to the exclusion of the coal fire. This feature detracts seriously from the value of the domestic load as a load-factor improver.



Figs. 4 and 5.—Composite Daily Load Curves of Water Heaters.

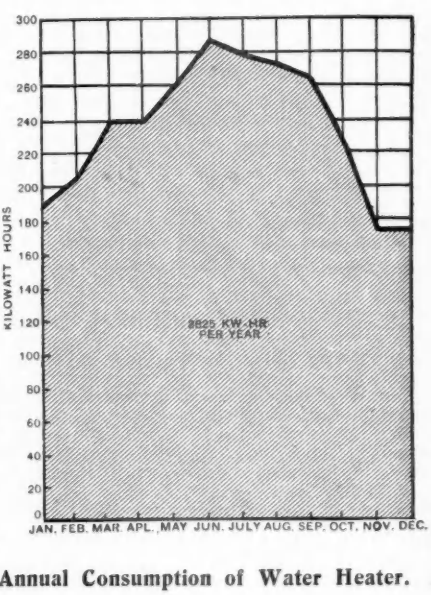
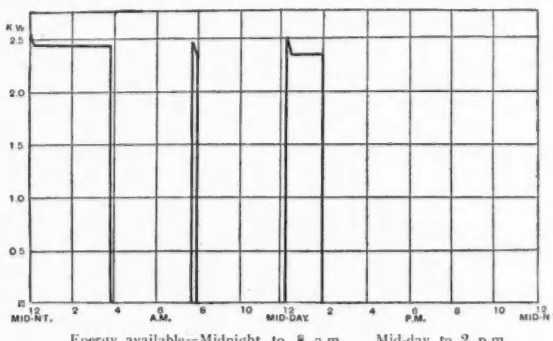


Fig. 6.—Annual Consumption of Water Heater.



Energy available=Midnight to 8 a.m. Mid-day to 2 p.m.
Rating=40 gallons, 2.5 kW, 230 V.

Fig. 7.—Water Heater, Time Switch and Thermostatic Control.

TABLE I.—TYPICAL DOMESTIC DATA.

	kWh per annum.
Lighting	200
Lighting and cooking	2,000
Lighting, cooking, heating	3,500
Lighting, cooking, water-heating	6,000
Lighting, cooking, water-heating, heating ...	7,500

The town of Basle, in Switzerland, was probably the first place where the development of water heating was encouraged on a comprehensive basis. Typical load curves for winter days in 1924 and 1915 are reproduced as fig. 1, and show that, not only has the total load increased considerably, but that the daily load factor has also risen from 56.5 to 74.4 per cent. Such an advance justifies more detailed study; for comparison, a typical load curve for a day in mid-December is given for a large undertaking in this country, together with a curve showing the period of utilisation of the load (fig. 2). The daily load factor was

51.4 per cent., which compares with 56.5 per cent. above for a foreign undertaking of smaller size. The figure indicates the larger amount of "filling up" which may be done.

Electric water-heating appliances range from those with a very low loading, which are intended for continuous energising (*i.e.*, with an individual load factor of 100 per cent.) to those with high loadings, which are intended for instantaneous use. For the former thermostatic control may be unnecessary, if the electrical rating is sufficiently low; for the geyser type thermostats serve no useful purpose. Between these limits there exists a variety of loadings and sizes of storage or semi-storage types of heaters for which thermostatic control is, if not absolutely essential, at least desirable in accordance with the best practice. Using thermostatic control only, it may be said that high-loaded heaters possess great diversity, whereas low-loaded heaters possess little, which aspect is forcibly illustrated by figs. 4 and 5, which were prepared as the result of tests in Detroit, U.S.A. Incidentally, it should be noted that the demand at times of system peaks may be appreciably higher with low-loaded heaters than with high-rated heaters. The superimposition of a load of high annual load factor upon the system load will naturally tend to raise the overall load factor, but the peak load of the system will be raised according to the peak demand of that particular class of load. If the water-heating load is, however, carefully controlled in time, the system load factor can be improved to a much greater extent without much increase in the peak demand, which fact is illustrated by charts obtained on a water-heating circuit in an all-electric house in Manchester: (*a*) with thermostatic control only (fig. 3) and (*b*) with time switches and thermostatic control (fig. 7). The service required in both cases was the same and the supply of hot water adequate. In the first case a considerable portion of the consumption occurred at time of system peak, whereas in the second case the load was entirely apart from the ordinary system day load. With lower loading the consumption during night hours would have been extended proportionately. The water-heating load varies according to the season to a small extent; fig. 6 indicates that the season variation is not, however, considerable according to the survey made in Detroit.

The foregoing particulars indicate conclusively that the best results from the point of view of load factor are to be attained by providing hot-water service by means of storage water heaters, controlled as regards time and thermostatically for reasons of safety and efficiency. It is important to note, however, that where the domestic tariff is sufficiently low to permit extensive use of space heaters, the provision of electrically-heated water may actually encourage the use of electric space heaters, and the benefits accruing from the night load may be largely negatived. Conditions on the Continent and in America, where the central heating of buildings is common practice, and where seasonal temperature variations are much greater than in this country, are not comparable with those obtaining here. The extensive use of electricity for room heating is impracticable abroad. An increase in night load per house of 1 to 2 kW is useless in the economic sense if the peak demand is to increase by 3 or 4 kW. In arriving at a suitable tariff for night load it is essential that the cost of supplying that load in the final state of development should be taken into account. Low, or so-called by-product rates, are unsound unless the ultimate condition of the supply undertaking is considered. Consideration should also be given to the desirability of working-class consumers not being tempted to spend beyond their means by too easy terms with regard to the purchase of electricity or the hire of apparatus. This is evidenced by the continued difficulties in the collection of accounts on housing estates, where rent, electricity, and gas charges are only met with extreme difficulty in hundreds of cases every quarter. Equity demands that domestic supply shall clear its own costs and not retard reductions in electricity charges which will in the near future be rightly due to industrial and trade users, who have borne the pioneering or development costs of the supply industry.

The I.E.E. London Students' Section.

The opening meeting of the Session. Summary of an address by Mr. H. T. Young, A.M.I.E.E., entitled "Is the Engineer of to-day making the Best of his Opportunities in Electrical Development?"

THE first meeting of the London Students' Section was held in the Institution theatre on Friday last. There was a large attendance, which augurs well for another successful session. Nevertheless, relatively to the number of students in London—about 1,500, or 40 per cent. of those enrolled everywhere, which is again about one-third of the aggregate membership of the I.E.E.—and also having regard to the importance of the subject of the address in the lives of all who have their way to make in the world, a much greater gathering might have been possible. This consideration justified the parody of the title of Mr. Young's address which Mr. W. F. J. Walton (honorary secretary) made when he asked, "Do student members make the most of the opportunities afforded by the Institution?"

MR. J. W. MOFFATT and MR. L. S. CRUTCH, the new chairman (last year's honorary secretary) referred to the progress being made in the section, and mentioned the part played by Messrs. H. T. Young and F. W. Crawter (who succeeds Mr. Young as Council's representative, after the latter's two years' service in that office) in the founding of the *Students' Quarterly Journal*, the first number of which has recently been issued to the 4,500 Students and Graduates under 28 years of age. Future numbers will contain, *inter alia*, abstracts of students' papers not published in the main *Journal*, short articles by students, and correspondence. Its success will rest, as its editor, Mr. J. H. Reyner, states in his opening commentary, on the wholehearted support given by each individual Student member.

MR. H. T. YOUNG, in his address, referred to the loyalty to American industry that he found on all sides in his recent tour of the U.S.A., where he came across no goods of foreign manufacture. The average American mind, particularly of the younger men, was trained to a degree of concentration far beyond that of the average British mind. Those were the people with whom we had to compete; countries and individuals who did not keep up with the pace thus set could not hope for the highest rewards. The industrial race could, however, be a friendly one when all the natural and artificial handicaps of modern life had been scientically adjusted. Mr. Young answered the question put in the title of his address by a bold "No." He urged foreign travel as the finest antidote to "mud disease," so easily picked up and so contagious; it came from the "rut."

Engineers, he said, neglected the selling side of the industry, and the electrical industry was changing so rapidly as to make the landmarks of to-day the pitfalls of to-morrow. The addresses of the last four I.E.E. Presidents should be read again and thought over. He suggested that if men engaged in power stations closed down under the grid schemes would turn their attention to the sale of electricity, they would find more diversified and lucrative opportunities than ever existed before. Half the industrial machinery of this country was driven by independent plant, which sooner or later would be connected to the grid, and there were many processes, from smelting to baking, which could be done better electrically. A large band of well-trained electrical engineers with a knowledge of business economics and finance, and with initiative and the pioneer spirit, would be required to explain to industrialists the benefits of a public and unlimited supply of electricity. There were very few men now equipped for this work, and it could not be left to the non-technical salesmen.

The great development in lighting in the last five years was due chiefly to the researches of the E.I.M.A., which had shown how industry and commerce benefited by improved lighting, and we were on the fringe of even greater lighting development. In lighting intensities we had followed America, and there about three times more light was used than in this country for nearly all purposes; this was due to the work of lighting engineers trained commercially in a lighting school. Water heating, cooking, room heating, and refrigeration could not be handled successfully by the same man. Specialisation was necessary. In the U.S.A. specialists continually sought out prospective consumers, and consulting engineers and contractors were called in to assist.

Mr. Young then cited statistics which showed that in San Francisco there were 33 telephones per 100 of the population. The average for the U.S.A. was 16, compared with less than four for Great Britain, London having eight as against 17 in Oslo. No large building was now erected in America without floor-ducts for telephones, and most had them for power and lighting outlets also.

It was the outlets to-day that sold the turbines to-morrow, and without the former the industry would have a bottle neck. In America no public utility carried out installation work on a consumer's premises, and the relations between the supply and contracting sides were good. On the other hand, general stores and other shops did a big business in the sale of electrical merchandise. This was unsatisfactory, as those who sold electrical apparatus should be capable of giving service with it.

The income of E.D.A. was less than £35,000 per annum, yet one firm of refrigerator manufacturers (originally founded in the U.S.A.) last year spent £40,000 in advertising

in this country. The address was followed by an animated discussion, but, as it is the intention that students shall express their views quite frankly at these meetings, it is not proposed to report their individual remarks. Inadequacy of remuneration was incidentally commented upon, and the "early Victorian" mentality of older members of the industry came in for a good deal of criticism. Probably too much may be made of age, *per se*, as a deciding factor in outlook on life, as many examples may be recalled of men of 30 years of age or so whose general attitude is more "early Victorian" than those with twice that number to their debit.

The speakers, as Mr. Young said in his reply, wandered away from the main point, which related to whether engineers were making use of their opportunities. Regarding the question of comparative wealth of Great Britain and America, he said that if £45,000,000 could be spent on improving the production of electricity, the industry should be able to find a few millions, if necessary, to sell it. The income of the N.E.L.A. was £200,000 per annum, and that of local electrical leagues another £200,000; these were supplemented by other local efforts. It was of no use being depressed about lack of opportunities; they must be made.

The following took part in the discussion:—MESSRS. F. J. SMITH, A. N. D. CARR, D. C. PLYER, N. HERWALD, T. H. LOCKETT, D. S. LAKE, R. C. JOYCE, F. W. CRAWTER, ADAM, and DANIEL.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

A New Network Box.

BRITISH INSULATED CABLES, LTD., Prescot, Lancs., have recently put on the market a new type of link or fuse disconnecting box for four- or five-core cables with several interesting features. All the current-carrying parts are made from high-conductivity copper strip, and the number of joints or contacts has been reduced to a minimum. The links are of the plug type, with bolted contacts. The bolts are fixed to the links, and provision is made so that the bolts cannot turn when tightening, and the nuts cannot be removed accidentally. The links are arranged for operation by means of a removable insulated handle and an insulated spanner. The fuses are of the enclosed type, attached to porcelain handles, and are arranged so that the contacts are tightened by means of an insulated screwdriver. Plenty of room is provided for opening out the cores of the cable, thus facilitating jointing. Fig. 1 is a view of the box showing brass glands for making wiped joints on to the lead, but it can be supplied with lead-strip bonding for both the lead and armour, with separate armour clamps bolted on. The phase and neutral busbars and fittings are mounted on four insulated steel rods, supported at each end by cast-iron brackets bolted to, but insulated from, the cast-iron box. The fifth-core busbar and fittings are mounted on blocks of insulating material suitably supported by wrought-iron brackets. The phases are separated by means of a varnished teak frame built so that compartments are provided for each set of links, and each phase is clearly distinguished by means of coloured-glass reflectors fixed to the separators. Circuit labels are fixed in positions which leave no room for doubt as to which links belong to the circuits indicated. The cover is of the diving-bell type, designed to resist a 6-ft. head of water with a reasonable margin of safety. The sealing of the diving-bell cover does not commence until its lower edge is completely immersed. To assist in determining that the box has been correctly levelled the compound vent and filling holes over each cable entry are arranged so that the ledges supporting the small plates are in alignment with the compound level in the box. Any outflow of compound, when filling the box, at one or other of these openings, would immediately show that the box was not level.

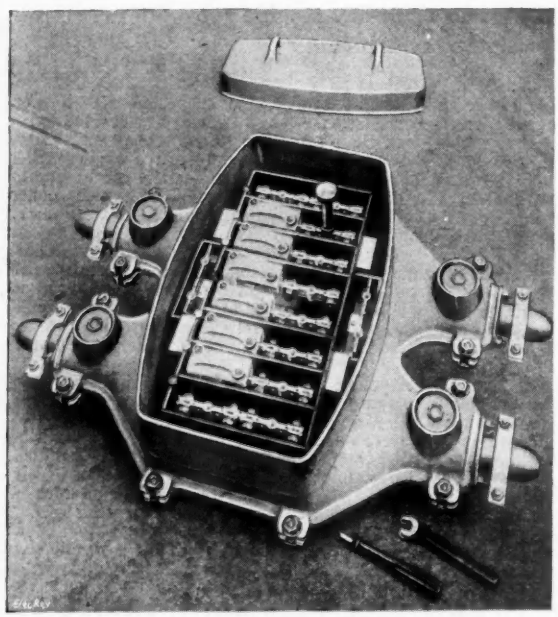
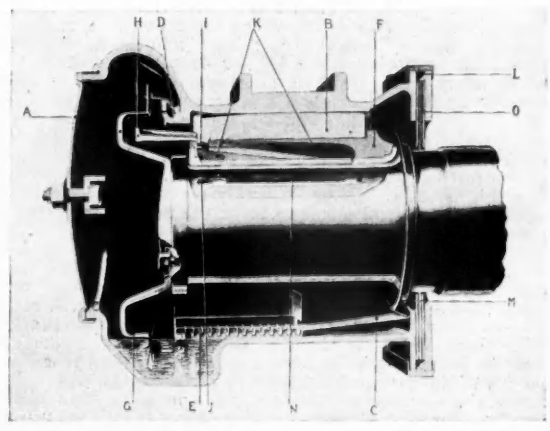


Fig. 1.—"B.I." Four-way Five-core Distribution Box.

A New Axle Box.

A new axle box which will probably interest those connected with electric traction has recently been introduced in this country by the BRITISH ISOTHERMOS CO., LTD., Park House, Great Smith Street, S.W.1, which is associated with Messrs. Sir W. G. Armstrong Whitworth & Co. (Engineers), Ltd., who will make the boxes. The construction and operation of the "Isothermos" axle box can best be explained by reference to fig. 2. The palette G, rotating with the axle, to which it is rigidly secured, picks up oil from the reservoir and carries it to the upper part of the box. The oil leaves the palette by centrifugal force and by drip. That leaving by centrifugal force is flung against the upper walls of the box, from which there is a copious flow to the central collecting channel D, From this channel the oil is led by one or more openings to the feeding tray H of the wedge block B, or of the bearing itself if no wedge is provided. The remainder of the oil drips by gravity from its two extremities, one of which has a segmental form specially designed to allow the oil ample time to free itself during its passage over the feeding tray H, from which the oil passes along a series of channels I, J, K, in the upper part of the bush F, and is distributed over the journal. Oil tending to escape along the axle at the rear of the bearing is picked up by the obturating ring M and flung off at high speeds, or drips off at low speeds, and the box at this point is so designed that the tendency of this oil is always to flow towards the reservoir, from which it is again



A, pressed-steel cover plate; B, wedge; C, tray leading to oil purifier; D, oil-collecting grooves in body; E, oil-purifying device; F, bearing bush; G, revolving oil dipper or palette; H, oil catchment tray on wedge; I, oil port in wedge; J, longitudinal oil grooves in bearing; K, oil feeding grooves in bearing; L, dust guard housing; M, oil retaining or obturating ring; N, dripping edge of oil groove; O, dust guard.

Fig. 2.—"Isothermos" Axle Box; Section.

passed into circulation. The oil dripping from both sides of the bush F along its full length falls into two outer filtering trays E in which any grit present settles in the partitions as it passes along on its return to the reservoir. The drip from the obturating ring M and the return flow from the rear end of the bush are differently dealt with, as there is a greater possibility of this oil containing particles of foreign matter which may have penetrated the dust guard. This oil is collected by the sloping surface C and fed through a central filter tray E on its way to the reservoir. The filter tray is provided with a cover, because when the axle ceases to revolve a large quantity of oil held in suspension by adhesion, cohesion and other forces falls suddenly on to the filter, and the effect of this would be to disturb any impurities collected in the tray and carry them through to the reservoir if it were not so protected. In order to indicate any signs of heating due either to lack of oil, failure to fix the palette, or any other cause, a detector plug of fusible metal can be provided in the front of the box which will melt and permit the escape of smoke, thus indicating trouble immediately it arises. It should be realised that the "Isothermos" system, not only lubricates, but cools, and the flow of oil is so copious—3 to 4 gallons per hour at 35 miles per hour—that the temperature of journals on high-speed long-distance trains does not, it is claimed, greatly exceed that of the human body.

A New Handlamp.

We have received from Messrs. Ward & Goldstone, Ltd., Frederick Road, Pendleton, Manchester, a sample of an electric handlamp, fig. 3, they have recently introduced. It has a pressed-steel case, is light in weight, and is fitted with a large-capacity "Volex" battery, rendering it particularly suitable

Fig 3.—"W. & G." Handlamp.

for such purposes as meter reading. Alternatively, the handlamp can be supplied with an unspillable-type accumulator capable of giving about 12 hours continuous light. A lever-type switch is fitted near the top of the case over the substantial projecting highly-polished reflector. Arrangements at the back enable the appliance to be used as a cycle lamp.

Coil Heater for Electro-plating Solutions.

Messrs. W. Canning & Co., Ltd., 133 to 137, Great Hampton Street, Birmingham, have recently introduced a new principle for heating electro-plating solutions by means of an electric coil. The heating element itself is made in the form of a flexible cable, and in fixing is generally laid on to the bottom of the tank as shown in fig. 4. The coil is so flexible that any desired arrangement can be effected in accordance with the requirements of the work, and to get the best results. There is no possibility of condensation, and the heat is transmitted direct to the solution. The covering of the cable is of chemically pure lead to withstand the action of the solution in which it is used. The exclusion of all free oxygen ensures that the insulation cannot scorch, or the element wire scale. The element terminates in a lead-covered supply cable, which is lead-burnt to the element by means of a special joint box, so that the whole heater, with its feeding wires, is electrically and mechanically one. The coil offers the following advantages: it occupies very little space, and the only working space taken is that occupied by the entry of the feeding cable into the vat; the coil itself can be arranged in any position desired: high efficiency of heating is obtained, as the heat is transmitted directly to the solution; a warm plating bath of even and correct temperature is assured; a single-heater installation can be arranged to give one or two heats with double control by means of switches, or more than one coil can be fitted, each with single-heat control. A complete outfit for one vat consists of an electric heating unit with the ends brought out for connecting to the plug or switch, and an ironclad switch-plug for the supply connection. When 2-heat control is desired for one vat, a control panel with a 2-way switch arrangement is provided. This panel carries the main switch, a separate switch for putting on maximum heat, a terminal box, and a pilot light. When more than one vat is to be heated, earthing control becomes necessary in order to provide an automatic break in the event of an earth connection on the vat itself. For this

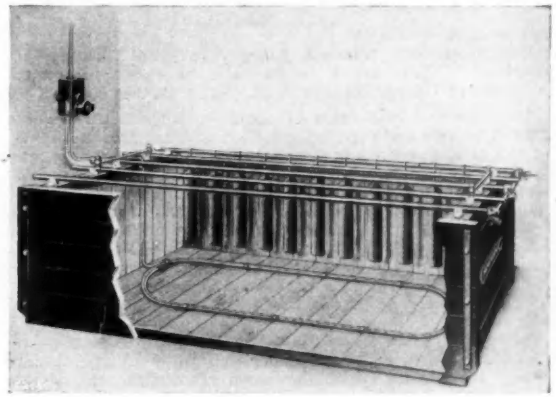


Fig. 4.—Heating Coil in Electro-plating Vat.

purpose automatic earthing devices for alternating and direct current are supplied. The single heaters have loadings up to 3 kW.

Reviews.

Hire-purchase Accounts and Finance. By C. W. Aston, A.C.A. Pp. viii+222. London: Gee & Co. (Publishers), Ltd. Price 10s. net.

In spite of the gloomy predictions made by several business economists as to the effect on hire-purchase trading of a slump in general business, latest figures available in this country and in America indicate a marked stability in the system, and a normal amount of repossessions arising from default. In fact, instead of proving the weak link in the economic chain, instalment selling is now claimed to have shown itself to be a reliable and established system of trading.

Although the larger hire-purchase companies are successfully negotiating the trade depression, however, several of the smaller concerns have gone to the wall, and it is apparent that, to be regarded as safe, the system must be applied along carefully planned and systematic lines. For this reason, this new book is to be welcomed in that it gives a comprehensive review of all of the aspects of accountancy bearing on the matter, and although the book is concerned chiefly with the financial aspects of the system, the author takes pains to establish the principles to be observed by retailers in conducting hire-purchase trading on sound lines.

The author gives a comprehensive explanation of the accountancy problems facing retailers selling goods on hire-purchase terms, and he sets out a system of accounts adaptable to the requirements of traders of all classes. Two chapters are devoted to the book-keeping system of hire-purchase trading. In the first chapter, full particulars are given of the records required to cope with the business, together with an explanation of the preparation of profit and loss accounts and balance sheets. The value of this chapter is considerably enhanced by the fact that the whole system is illustrated with reference to the figures of a hypothetical firm, and by following these figures through the various forms, the reader is able to gain a very clear idea of the accounting machinery involved.

The second chapter, on the book-keeping system, explains how the broad principles of the system can be modified to suit the needs of the particular firm, and also gives details of the "Stock System" of keeping hire-purchase accounts. An interesting section on the book-keeping of private finance companies is included, showing how duplication of work can be avoided where a trader or group of associated trading companies has formed a private finance company to act as an intermediary for obtaining bank loans.

Supplementary chapters to those dealing with the various book-keeping systems are devoted to the treatment of profit on hire-purchase sales, and the treatment of bad and doubtful debts. Several pages are also given to an examination of the published balance sheets of companies which conduct hire-purchase business, and in an appendix to the book five *pro forma* examples of balance sheets are included to show methods in common use, and to illustrate variations in points of detail encountered in practice.

In addition to a survey of the financial side of hire-purchase trading, the author gives an outline of the law affecting hire-purchase agreements, including references to recently-decided cases. He also deals with the income-tax liability of hire-purchase traders, and in this connection he includes an explanation of the scheme concluded last year between the Board of Inland Revenue and the Hire Traders' Protection Association.

Altogether the book represents a very valuable addition to the literature of hire-purchase trading, and its purchase can be recommended both to the trader who is already engaged in hire-purchase business and to the retailer who contemplates the adoption of this type of trading.

Ralph Stranger's Wireless Library for the "Man-in-the-Street." Numbers 8 to 12. Pp. 64 each; illustrated. London: George Newnes, Ltd. Price 1s. net each.

The author of this series of booklets, who writes under a pseudonym, has had experience with a wireless firm in answering technical questions in the early days of broadcasting, and was for seven years a teacher of wireless at technical institutes, so that he fully understands the difficulties of the "man-in-the-street" who sets out to understand the principles of wireless signalling. It is one thing to be able to understand difficulties and quite another thing to be able to smooth them out in cold print, but we think that Mr. Stranger can do both.

His plan is to write in a homely conversational style which, though naturally lacking conciseness, favours simplicity and readableness.

This second series is, on the whole, up to the same standard as the first series, and we consider that to be a high standard for the purpose for which the books are written; not indeed that we can go all the way with Mr. Stranger all the time. Sometimes he goes such a very long way, as when he tells us, as if he knew, that our souls will go to the planets or other stars. But such lapses into imaginative prophecy are rare, and as a rule his breezy generalisations hit the mark, as "It is impossible to sell wireless goods as one sells fish and chips," "Buy only the best valves with a guarantee behind them," "An ignorant wireless dealer is a source of danger to the progress of broadcasting, and the sooner he is out of business the better," "Measuring instruments in wireless reception are as necessary as the various measuring instruments on the dashboard of a motor car."

The booklets, which are in paper covers, are well produced, and the diagrams are excellent. The subjects dealt with in this series are: Wireless Waves; Wireless Communication and Broadcasting; Modern Valves; How to Understand Wireless Diagrams; and The Selection of Wireless Signals. To make the series complete, the author tells us, six more books will be required, making eighteen in all, and if the remaining six are up to the same standard as those already published there is no doubt that Ralph Stranger's Wireless Library, when revised (as the author anticipates it will be) should form a very good, if rather lengthy, theoretical wireless course for the "man-in-the-street."

Legal.

Distributing Box Explosion.

In the Southwark County Court recently, before Judge Moore, Mrs. Jessie May Jackson, of 29, Ambrose Street, Bermondsey, S.E., sued the Bermondsey Borough Council to recover damages for personal injuries through the alleged negligence of the defendant's servants.

The plaintiff stated that on June 13th last she was walking along Ambrose Street, Bermondsey, pushing a perambulator containing an eighteen-months-old baby. She noticed men working on a distributing box on the corner of the road, and she stopped for a moment as one of the men was in her way, and she wanted to go past. She was then startled by a flash and an explosion, and she was thrown backwards and fell heavily to the pavement, suffering extensive bruising; the perambulator was also flung backwards, but fortunately did not overturn, and the baby was uninjured. The plaintiff alleged that there must have been carelessness or negligence to cause the explosion, and that she was therefore entitled to damages in consequence.

On behalf of the Council, Mr. Paul Bennett, V.C., stated that expert workmen were employed on jobs where there were live mains, but, however careful they were, at times there were short circuits.

Judge Moore said that there must have been some sort of error or negligence somewhere if the conditions were such that the accident became inevitable, and expressed the view that the work of testing live cables should be undertaken during a period of the day when there were fewer pedestrians. Judgment for £21 was entered for the plaintiff with costs.

A Loud-speaker Passing-off Action.

In the Chancery Division on October 29th Mr. Justice Clauson granted a perpetual injunction in the action which Ideal Werke, A.G., German exporters of wireless goods, brought against the Willesden and District Light Supply Co., Ltd. The plaintiffs complained that a "Navy Spot" loud-speaker unit which the defendants sold was so similar to the "Blue Spot" power unit which they exported as to cause confusion. The defendants did not defend the action, and after hearing the evidence his Lordship granted an injunction restraining the defendants from passing off as of their manufacture cartons and portions of the unit in question which could be calculated to deceive. His Lordship also made an order for costs against the defendants, delivery-up, and for an inquiry as to damages.

Correspondence.

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession.

Young Engineers for Abroad.

With reference to "Afrikander's" remarks on the above subject in your issue of October 3rd, I agree with the bulk of his remarks, but I am not in agreement with his figure of £500 per annum as the minimum amount for living comfortably in Johannesburg. It may be interesting to have the opinion of an Englishman who has been abroad, so I can state definitely that whilst in Johannesburg from 1928-1930 I met many married people with families living on £400 per annum and even less. These people were able to run a car, have an annual holiday, and keep a daughter at the University in one case.

The cost of living in South Africa is often very much overstated. So far as I am concerned, living was no more expensive than in England.

If young engineers can get a start at anything over £350 per annum, I am quite sure they will get along quite well.

C. S. Hann.

Los Angeles, Cal., *October 17th*, 1930.

Phasing of E.h.p. Cable Joints.

My attention has been directed to correspondence in the Electrical Review of October 17th and 24th on the above subject. I am rather surprised to find that the question of matching colours in e.h.p. 3-phase joints should still be a matter for discussion. The practice of twisting the cable in order to bring cores of similar colour together cannot be too strongly condemned, and those people who, as described by "Foreman Jointer," force the cores round by the careful use of a short bar are laying up trouble for themselves. The idea that the cracked paper of the cores will be remedied by filling the joint box with compound is absurd, because the crack will probably take place in the crutch of the joint, admittedly the weakest part.

Cable makers generally put coloured papers on the cores of e.h.p. cables because purchasers ask for them, but many miles of cable have been made without any distinguishing marks on the cores. The undersigned has for many years been an advocate of unmarked cores, largely because the presence of coloured papers on the cores is a temptation to inexperienced people to endeavour to match them, to the everlasting detriment of the cable.

It is true that for convenience when connecting services low-pressure distributing mains must have coloured cores, and these must be matched when jointing so that any particular phase can be readily identified at any point where the cable is cut. The increasing size of conductors used in such mains tends to make this rule difficult to follow. A further difficulty associated with jointing cores colour to colour is that joints must always be between an "A" and a "Z" end. If by any chance two "A" ends or two "Z" ends come together, it is impossible to match the cores by any amount of twisting. The only course is to pass one core between the other two; this generally involves a non-standard joint box.

In conclusion, it cannot be too strongly emphasised that whether the cores of e.h.p. cables are coloured or not the colours should be neglected at the joints. A record can always be kept of how the colours are connected at each joint if it be thought desirable.

M. C. Timms.

London, S.E.18.

Electrical Hop Drying.

As you very rightly indicate in your leaderette on this subject, conventional methods and existing apparatus are not necessarily most suitable for adaptation for electrical use. Experience in every industry has shown that entirely new designs are necessary if the utmost advantage is to be taken of

the aid of electricity. You may be interested to note that your suggestion of a modified "biscuit oven" is already in existence; in fact, it was exhibited at the Manchester Show of the Royal Agricultural Society this year. Another form of gravity drying apparatus, which arrived at much the same end, was also exhibited. The great difficulty in obtaining machinery for electro-farming is this lack of appreciation on the part of engineers that a different form of machine is required, if it is to be electrically operated. Even electric motors require re-designing for farm use—just as they have been for cotton mill applications. I now possess an electric grinder especially designed for its job, without belts or gearing, that will do as much work with one horse power as the traditional mill will do with a 5-h.p. electric motor.

R. Borlase Matthews.

Greater Felcourt, *October 28th*, 1930.

Control of Electric Welders.

In my position as maintenance electrician I have under my charge several types of welding equipment, including butt, spot, seam, and quasi-arc. With the exception of the quasi-arc, all types are operated by mechanical switching in the primary circuit.

Considerable time has been spent in trimming the switch points due to highly-inductive arcing. I should like to get some of your readers' views on the subject of fitting some form of choke or magnetic blow-out.

I really can't think that manufacturers have refused to consider the point—is it just a case of prevention not being worth the price of a cure? The fact remains that attention, such as this form of equipment demands, brings complaint from departments using it to the prejudice of our welding plant.

W. S. Search.

London, S.E.16, *November 1st*, 1930.

"Tales Engineers Tell."

Over twenty-five years ago in Partick, Glasgow, we charged on the maximum demand system. The chief clerk (whom we suggested should be provided with a revolver and slide rule) was deputed to explain this system to inquisitive customers. As most Scotchmen are inquisitive, and Scotch ladies (with one exception) are worse, the job was no sinecure.

Every time an account was rendered to him, a certain butcher would call and seek another explanation, and every time he left he would remark that he had "got it at last."

One evening he met the chief clerk, and stated: "I understand that maximum demand system now, you won't catch me any more."

The clerk replied that he was delighted, and congratulated the butcher, who added: "Yes, I've got gas in again, and I use gas for four nights and electricity on Saturday nights."

A. J. Abraham.

Bexley, *October 31st*, 1930.

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The number in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1929.

10,272. "Electrical musical instruments." M. L. E. Martenot. April 2nd, 1928. (308,988.)

11,286. "Electrically-heated fabrics." A. Negromanti. April 11th, 1929. (336,270.)

13,284. "Circuits for the provision of potentials for thermionic valves." L. Koros. June 6th, 1928 (313,075.)

15,523. "Thermal control of electrical apparatus." H. H. Berry and C. A. Painton. February 17th, 1930. (335,978.)

20,701. "Manufacture of coloured electric glow lamps." I. G. Farbenindustrie Akt. Ges. July 11th, 1928. (315,313.)

20,708. "Cement for caps for electric incandescent lamps and the like." General Electric Co., Ltd. August 4th. 1928. (316,866.)

20,713. "Metal arc and metal vapour lamps." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). July 5th, 1929. (336,208.)

20,714. "Electric discharge tubes." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). July 5th, 1929. (336,222.)

20,744. "Antennæ, especially for short waves." M. A. Bontch-Brouewitch and V. V. Tatarinov. July 5th, 1929. (336,223.)

20,947. "Transmitters for printing-telegraph apparatus." Siemens and Halske Akt. Ges. October 25th, 1928. (336,278.)

20,962. "Electric horns." J. E. Pollak and M. Greiner. July 8th, 1929. (336,228.)

20,973. "Electric switches in which compressed gas is used for preventing sparking." S. Ruppel. July 8th, 1929. (336,230.)

20,989. "Electric circuit-controlling switches." O. N. Tevander. July 8th, 1929. (336,255.)

21,076. "Television and like systems." Electrical Research Products, Inc. July 13th, 1928. (315,417.)

21,179. "Telephone transmission systems." Standard Telephones and Cables, Ltd., A. R. A. Rendall, and E. K. Sandeman. July 10th, 1929. (336,259.)

21,222. "Apparatus for the control of electric motors." J. Zetzsche and J. Sinclair-Ross. July 10th, 1929. (336,262.)

21,341. "Manufacture of thermionic electrodes of vacuum electric tube devices." Westinghouse Lamp Co. July 11th, 1928. (315,324.)

21,553. "Telegraph repeating devices." Electrical Research Products, Inc. July 18th, 1928. (315,791.)

21,574. "Electric ignition systems for internal-combustion engines." R. Bosch Akt. Ges. November 5th, 1928. (336,299.)

21,616. "Electrical altitude-indicating systems for aircraft." British Thomson-Houston Co., Ltd., and T. H. Kinman. July 13th, 1929. (Addition to 317,068.) (336,303.)

21,632. "Scales and the like for use with wireless apparatus." Graham Amplion, Ltd., E. N. Elford, and D. Sinclair. July 13th, 1929. (336,304.)

21,634. "Indicator scales for use in wireless apparatus." Graham Amplion, Ltd., and E. N. Elford. July 13th, 1929. (336,305.)

21,856. "Train-control systems." Associated Telephone and Telegraph Co. July 16th, 1928. (315,716.)

21,900. "Electrical bridge systems." H. W. Sullivan, Ltd., and W. H. F. Griffiths. July 16th, 1929. (336,313.)

22,163. "Vacuum tube lighting systems." A. E. White (C. Neon Lights, Inc.). July 18th, 1929. (336,314.)

22,371. "Electric cables." British Insulated Cables, Ltd., and J. L. Packer. July 20th, 1929. (336,320.)

22,610. "Loud-speakers." A. W. Harris. July 23rd, 1929. (336,322.)

22,832. "Electric igniters." N. Allday and H. R. Allday. July 25th, 1929. (336,325.)

23,298. "Artificial impedance for telephone repeaters." Soc. des Téléphones Grammont. November 24th, 1928. (336,331.)

23,448. "Arrangement for the excitation of synchronous or asynchronous wattless output machines." Siemens-Schuckertwerke Akt. Ges. July 31st, 1928. (316,584.)

24,581. "Fluid-operated relay mechanism for the automatic control of physical or electrical quantities." A. G. S. Sandison. August 12th, 1929. (336,346.)

24,980. "Lighting installations for signs." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). August 15th, 1929. (336,351.)

25,715. "Multiple-filament incandescent lamps." British Thomson-Houston Co., Ltd. August 23rd, 1928. (317,833.)

26,670. "Submarine acoustic apparatus." Submarine Signal Co. October 27th, 1928. (336,368.)

26,852. "Weatherproof electric filament lampholder." A. E. Howard. September 4th, 1929. (336,369.)

27,377. "Switching means for use in connection with electromagnetic vibratory devices." Gramophone Co., Ltd., and A. S. Radford. September 9th, 1929. (336,371.)

27,439. "Electric plug-and-socket couplings." R. T. Waite. September 10th, 1929. (336,372.)

27,850. "Electric torches and the like." R. Costigan. September 13th, 1929. (336,374.)

28,948. "Microphones and like telephone transmitting instruments." S. G. Brown. September 24th, 1929. (336,387.)

29,583. "Photo-sensitive cells." Arcturus Radio Tube Co. January 11th, 1929. (336,397.)

29,688. "Electric switches with free release." Felten & Guilleaume Carlswerk Akt. Ges. February 26th, 1929. (336,401.)

29,908. "Electric cables." W. T. Henley's Telegraph Works Co., Ltd., and P. Rosling. October 3rd, 1929. (336,408.)

30,052. "Direct-current electromotors" F. Bohm. October 3rd, 1929. (336,409.)

30,608. "Electric incandescent lamps and holders thereof." E. R. Grote. October 9th, 1929. (336,418.)

30,751. "Combined variable inductance and electric switch for frequency-controlling systems." Federal Telegraph Co. and A. M. Trogner. October 10th, 1929. (336,420.)

30,911 "Electric fuses for blasting." Oesterreichische Dynamit Nobel Akt. Ges. November 14th, 1928. (Patent of addition not granted.) (336,423.)

32,984. "Electric accumulators." W. R. Edwards and Edwards & Co., Ltd. October 30th, 1929. (336,448.)

33,123. "Alternating-current induction motors." Siemens-Schuckertwerke Akt. Ges. December 13th, 1928. (336,450.)

33,163. "Synchronised sound re-production and picture projection." British Consolidated Investments Corporation, Ltd. October 31st, 1928. (336,451.)

33,173. "High-potential air-brake electric switches." Koch & Sterzel Akt. Ges. November 7th, 1928. (336,452.)

33,276. "High-tension electric switches." International General Electric Co., inc. November 1st, 1928. (336,453.)

33,521. "Electric switches adapted for mounting together on switchboards." J. S. Withers (General Steel Wares, Ltd.). November 4th, 1929. (336,457.)

35,286. "Electric switches." J. B. Tucker. November 19th, 1929. (336,476.)

36,246. "Picture and the like telegraph systems." Marconi's Wireless Telegraph Co., Ltd. November 26th, 1928. (336,483.)

37,059. "Electric cables." P. H. Chase. December 3rd, 1928. (336,488.)

37,228. "Luminous electric discharge tubes." General Electric Co., Ltd. July 13th, 1929. (336,490.)

37,289. "Loud-speakers, telephones for wireless, and the like." C. G. Hunt. December 5th, 1929. (336,491.)

37,933. "Bars for windings, in particular for single-layer windings of commutator machines." Siemens-Schuckertwerke Akt. Ges. December 21st, 1928. (336,497.)

1930.

820. "Internal-combustion engine-driven vehicles with electric transmission." O. Simmen June 13th, 1929. (336,510.)

3,803. "Electric suspension insulators of the cap and bolt type." Porzellanfabrik P. Rosenthal & Co. Akt. Ges. December 11th, 1929. (336,529.)

9,520. "Rotors for dynamo-electric machines." Associated Electrical Industries, Ltd. March 26th, 1929. (336,547.)

22,545. "Metal boxes such as used for containing switches, fuses, or other electrical appliances." J. A. Crabtree. May 25th, 1929. (Divided application on 333,945.) (336,213.)

29,177. "Television and like systems." Electrical Research Products Co., Inc July 13th, 1928. (Divided application on 315,417.) (336,267.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 29th:—

C.K.B., Bartos Vernier Dials (lettering and design). No. 514,486. Class 8. Instruments and apparatus for use in radio-telephony and telegraphy.—Embake Radio Gesellschaft, Berlin. (British representative: A. A. Thornton, 7, Esser Street, W.C.2.)

Birka. No. 514,750. Class 8. Thermostatic regulators for electric heating and cooking appliances, automatic electric switches and cut-outs, and electric relays.—Birka Regulator Co., Ltd., 17, Victoria Street, S.W.1.

Novogram. No. 515,560. Class 8. Instruments and apparatus for radio signalling, sound reproducers and thermionic amplifiers, electric gramophones in combination with radio receiving sets, &c.—Gambrell Bros., Ltd., 307, Merton Road, Southfields, S.W.18.

Radiovisor. No. 515,725. Class 8. Scientific instruments.—Radiovisor Foreign & Colonial, Ltd., 11-12, Pall Mall, S.W.1.

Enfelbond. No. 516,098. Electric cables. No. 516,100. Class 13. Junction boxes for use in connection with electric cables.—Enfield Cable Works, Ltd., 296-302, High Holborn, W.C.1.

Enfelloy, No. 516,099, Class 8, and No. 516,101, Class 13; and Enfelite, No. 516,102. Class 13. Junction boxes for use in connection with electric cables.—Enfield Cable Works, Ltd., 296-302, High Holborn, W.C.1.

Ultrasol. No. 514,339. Class 13. Electric lamps (ordinary), and electric light fittings.—Naamlooze Vennootschap Philips' Gloeilampenfabrieken, Eindhoven, Holland. (British representatives: Boult, Wade & Tennant, 112, Hatton Garden, E.C.1.)

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

BIRKENHEAD.—Central school, Tollemache Road; R. W. Johnston, architect to the E.C.

BIRMINGHAM.—Houses (2,200), various estates; W. E. Edwards, Contractors, Ltd., Henry Boot & Sons, Ltd., Jacombs & Sons, Ltd., and W. J. Simms, Sons and Cooke, Ltd. Cinema, College Road, Perry Common, for the Mayfair Cinemas, Ltd.; E. Garfield & Co., Ltd., builders, 30, Birchfield Road, Aston Manor.

BOLTON.—Sessions hall, library, museum, art gallery, &c.; R. Mosley, builder, Charnock Street Saw Mills.

BOOTLE AND WALLASEY.—Houses (321) for the T.C.'s; Lloyd & Cross, builders, 57, Hamilton Square, Birkenhead.

BOURNEMOUTH.—Stores, Palmerston Road; Bournemouth Ice and Ice Cream Factory, Ltd. Theatre, Hinton Road; Bournemouth Little Theatre Co. Central and junior schools, Kinson, for the E.C.

BRIDLINGTON.—School, Priory Fields, for the borough E.C.; P. M. Newton, architect.

BRIGHTON.—Houses (221) for the T.C.; borough surveyor. Talking-picture studio (£100,000); Stanley Earl.

BRISTOL.—Houses (128) for the T.C.; city engineer. Schools, Horfield (1,200 places), for the city E.C.; director of education.

BUCKS.—Schools, Cippenham (£27,000) and Chesham (£11,500); education architect, Aylesbury.

COLCHESTER.—Central school for the city E.C.; director of education.

COVENTRY.—Isolation hospital, Pinley, and technical college, The Butts; city engineer.

CUMBERLAND.—School (320 places), Alston, for the county E.C.; director of education, Carlisle.

DENNY.—Houses (120), Herbertshire Park; burgh surveyor.

DERBY.—Senior school for the borough E.C.; C. H. Aslin, borough architect, Gower Street.

DONCASTER.—Houses (76) for the R.D.C.; Leadley & Co., builders, Askern.

DUDLEY.—Houses (187), Priory estate (£68,000); Butler Bros. Elementary school, Blowers Green, for the E.C.

DUMFRIES.—Cinema (£17,000) for Scottish Cinema and Variety Theatres, Ltd., Glasgow; C. J. McNair, architect, 112, Bath Street, Glasgow.

DURHAM.—Central hospital; County Public Assistance Committee.

EAST GRINSTEAD.—Houses (50) for the U.D.C.; surveyor.

EAST SUSSEX.—School, Hailsham, for the county E.C.; director of education, Lewes.

EGHAM.—Public offices (£15,250) for the U.D.C.; surveyor.

ESSEX.—Schools (450 places) at Pitsea and Romford (380 places) for the county E.C.; W. O. Lester Smith, director of education, Chelmsford.

GLAMORGANSHIRE.—Schools, Deri (£18,000), Trelewis, Tiryberth (£13,500), and Hengoed (£11,000) for the county E.C.; director of education, Cardiff.

GLASGOW.—Houses (1,100) for Corporation; city architect. Houses (198), Torbeck Street, baths, Wolseley Street (£20,000), public library, Gorbals (£20,000); city engineer and trade contractors. Cinema, Cumbernauld Road; G. U. Scott, 154, West Regent Street.

GRAVESEND.—School, Whitehill, with lighting and heating work (£28,258) for the borough E.C.; education architect.

HANTS.—Senior schools, Eastleigh (360 places), and Fareham (400 places), for the county E.C.

HERNE BAY.—Various improvements, including promenade (£30,000); U.D.C. engineer.

HORNCHURCH.—Houses (48), Harwood Avenue, for Wood and Wren.

HULL.—Baths (£48,500) for the T.C.; city engineer. Hospital for the Mental Hospital Committee (£23,607), and works for the Steel Wire Co. (£55,574); R. G. Farran, builder.

IRISH FREE STATE (SKIBBEREEN, Co. CORK).—National school; T. Cassedy, secretary, Office of Public Works, Dublin.

(WATERFORD).—Houses, Rockshire, Ferrybank, for the Corporation; city surveyor, 12, The Mall.

KENT.—Schools, Hawkhurst, Tenterden, Old Bexley, Faversham, West Wickham, Snodland, Orpington, Sutton Valence, Wingham, and Borough Green, for the county E.C.; Director of Education, Maidstone.

KINGSTON-ON-THAMES.—Houses (140) for the T.C.; Bentalls, Ltd., builders.

KNOTTINGLEY.—Electric lighting installation, Beal Schools, for the E.C.; C. Harris, clerk.

LANARKSHIRE.—Advanced division school, Motherwell, for the county E.C.; John Stewart, architect, 20, Albert Street, Motherwell.

LANCASHIRE.—New schools (20) and extensions, Eccles secondary school (£15,426), for the county E.C.; director of education, Preston.

LARKHALL (LANARKSHIRE).—Re-erection of Grand Central Cinema, Union Street, electrically equipped; manager.

LONDON (SPITALFIELDS, E.).—Tenements, Holland estate (£28,738); A. T. Rowley, Tottenham.

(HIGHGATE, N.).—Secondary school, Highgate Road; L.C.C. architect.

(HOLLOWAY, N.).—Tenements, Wedmore Street; L.C.C. architect.

(STAMFORD MILL, N.).—Tenements (£117,080) for the L.C.C.; Rowley Bros., Ltd., Tottenham.

(SOUTHWARK, S.E.).—Tenements, Tabard estate (£18,757); J. E. Billings & Co., Ltd.

(WOOLWICH, S.E.).—Schools (3,000 places); L.C.C. architect.

(PUTNEY, S.W.).—Extensions, Huntingdon Road school (£13,293); W. H. Gaze & Sons, Ltd., Kingston.

LOWESTOFT.—School, Roman Hill, for the borough E.C.; director of education.

LUTON.—School (£27,442) for the borough E.C.; education architect.

MANCHESTER.—Houses (378), Rider Brow estate; and police station, Platt Lane (£22,640); city architect.

MIDDLESEX.—Extensions, Springfield Mental Hospital (£85,919); L. & W. Whitehead. School, Ickenham (£9,077); Fassnidge & Sons, Ltd., contractors, Uxbridge.

MINEHEAD.—Houses (60) for the U.D.C.; surveyor.

MORECAMBE.—Town Hall; W. H. Law & Sons, quantity surveyors, Liverpool.

NORTON (YORKS.).—Houses (40) for the Workmen's Housing Association, Ltd.

NUNEATON.—Sewage disposal works; borough surveyor.

ROCHDALE.—Girls' secondary school, Greenhill; J. E. Holden, secretary of education.

SADDLEWORTH.—Sewage disposal works (£92,000); surveyor to U.D.C.

SEDGEFIELD.—Houses (100) for the R.D.C.; surveyor.

STOCKPORT.—Schools, Nangreave Road, for the borough E.C.; director of education.

WADDON.—Houses (68), Mitcham Road; H. Macintosh.

WHITEFIELD.—School; secretary to the Local Education Committee.

WORTHING.—School (£20,000) for the borough E.C.; director of education.

WREXHAM.—Abattoirs for the T.C.; John England, borough surveyor.